

Geel 2000 Language Schools

Prep. (2)

Unit (1)

First term



SOLID



GAS



LIQUID

Name:.....

Class:



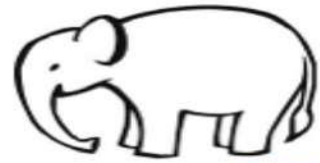
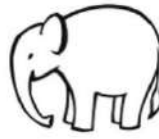
UNIT (1) LESSON (1) STATES OF MATTER



Matter: Anything has volume (takes up and mass).

Volume: Space occupied by an object.

Mass: amount of matter in an object.



(mass is a fixed amount that doesn't change from one place to another)

- There are 3 States of matter:

1- Solid : wood, plastic and iron.

2- Liquid : milk, water and oil.

3- Gas : Air, Oxygen and Nitrogen.



Fluids

Materials that have the ability to flow and take the shape of the container, such as gases and liquids.

Main
physical
properties

Shape and flow ability

Volume and Compressibility

Ability to Diffuse



Flowability: Ability of substance to flow.

Liquids vary in their ability to flow according to their viscosity.

Give Reason:

1- Movement of sand not considered flow?

Because sand is not a fluid, and the transfer of the particles that make it up from one place to another does not change the shape of the grains

2- The flow rate of honey differs from the flow rate of water

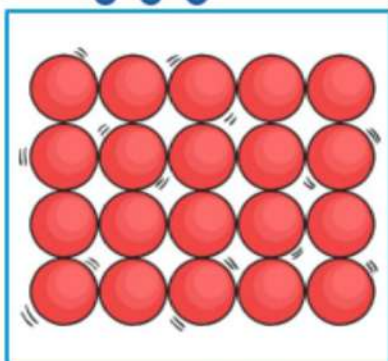
Because the viscosity of honey is greater than that of water, and the ability to flow decreases with increasing viscosity



SOLID

has fixed shape and volume that do not change when moved from one place to another.

has particles that are packed closely together.



solid

EXAMPLES

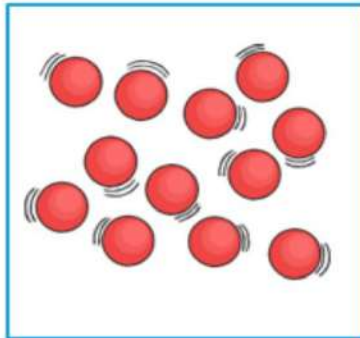
» Iron

» Wood

» Ice



LIQUID



Liquid

has definite volume, but indefinite shape

has particles that can move (flow) and take the shape of the container, but their volume remains unchanged.

EXAMPLES

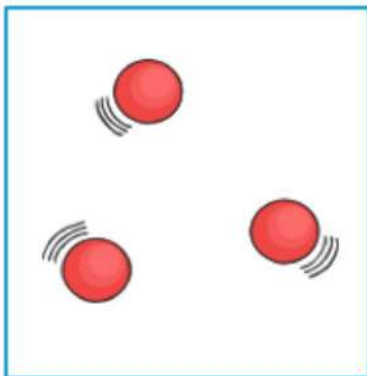
» Oil

» Juice

» Water



GAS



Gas

has no definite volume and shape

has ability to flow very fast and change their shape according to the container.

EXAMPLES

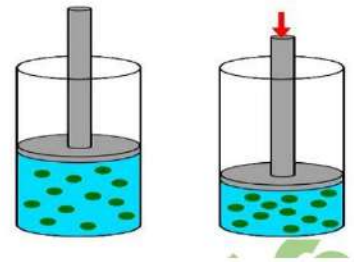
» Steam

» Water vapor



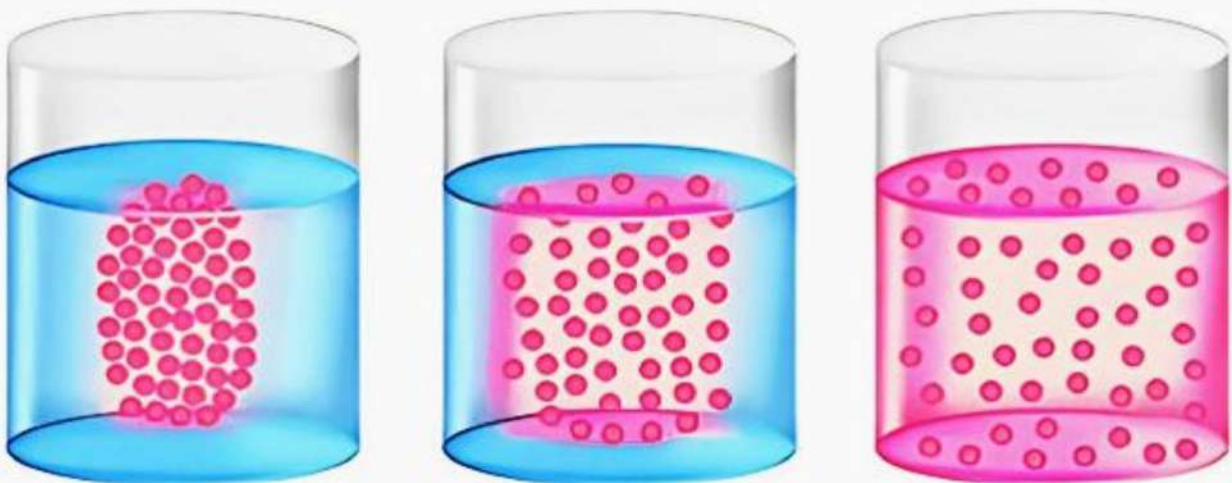
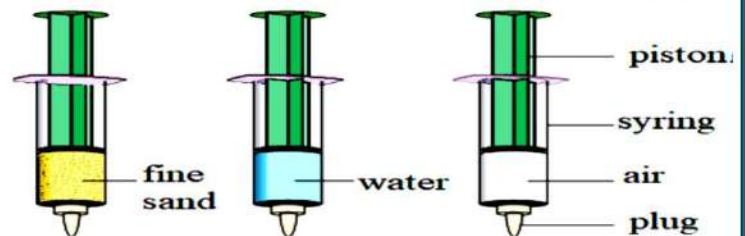
Compressibility

Ability of a substance to decrease in volume when pressure is applied.



Diffusion

Process by which particles move from an area of high concentration to an area of low concentration until they spread out evenly.

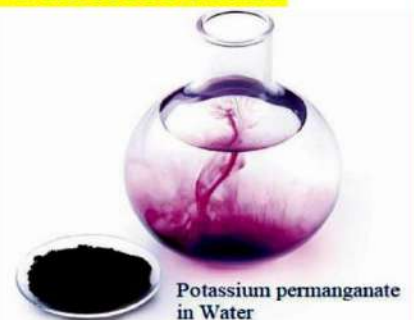


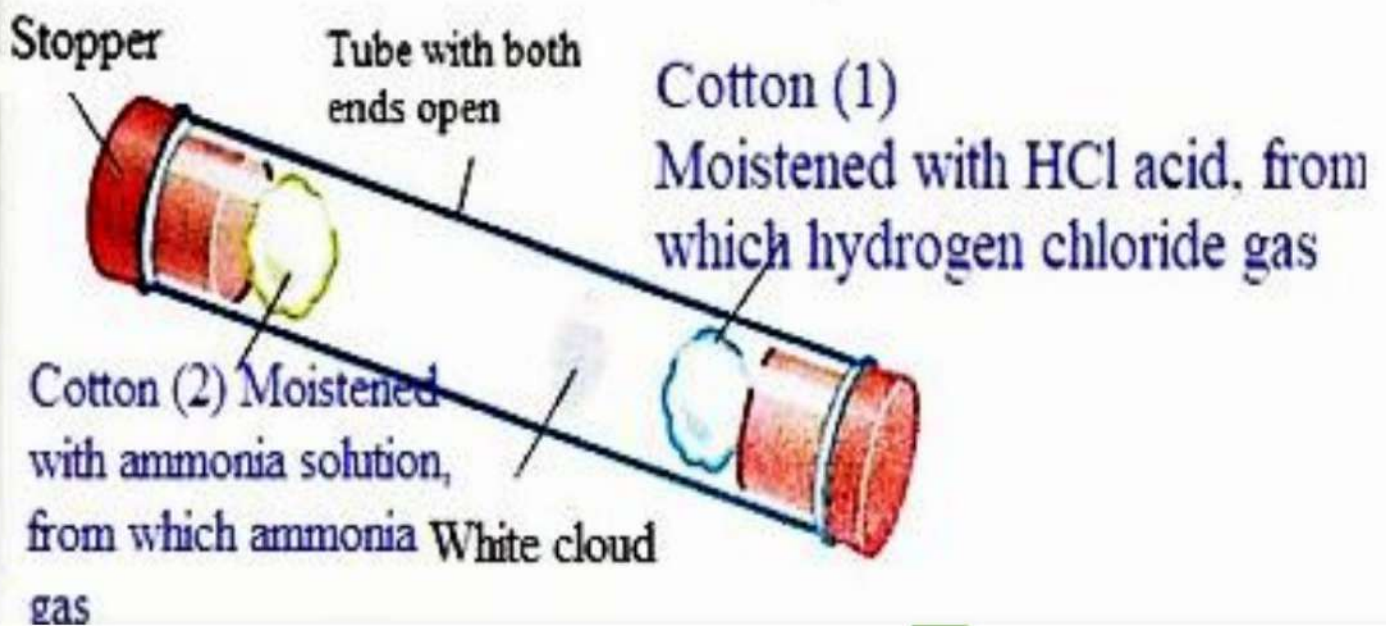
Factors affecting the diffusion

1- Temperature.

- Higher temperature leads to **faster** diffusion.
- Lighter particles diffuse **faster** than heavier one.

2- Particle Mass

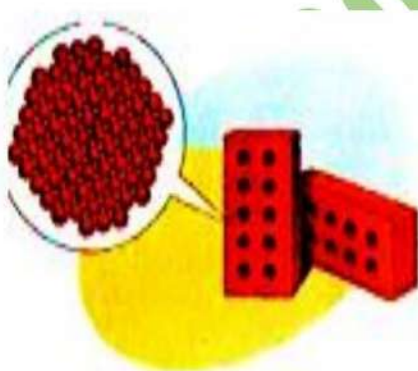




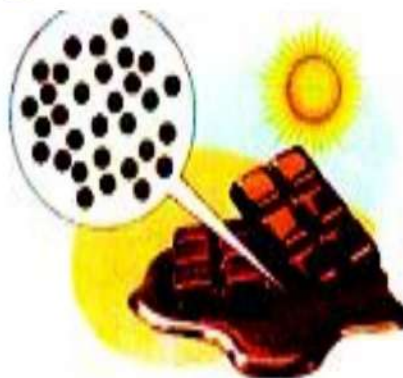
Note : Ammonia gas diffuses **faster** than **hydrogen chloride** gas and their meeting point is near the cotton (1), Because the mass of ammonia molecule is less than the hydrogen chloride so its diffusion rate is fast.

The particle model of matter

Any substance consists of very small units called **particles** that can't be seen by **naked eye**.



Particles of solid matter



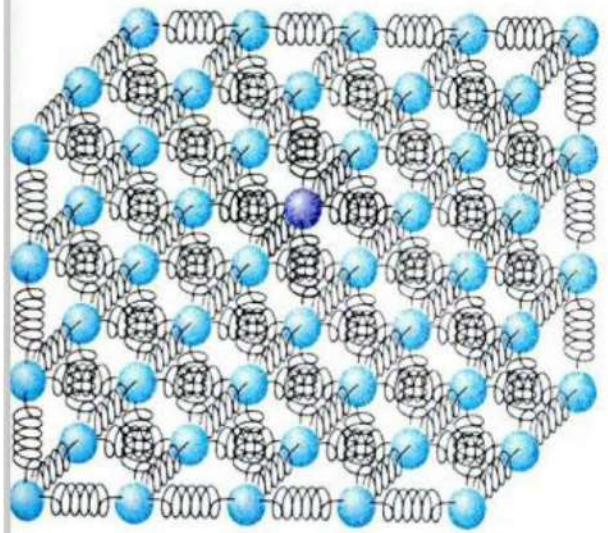
Particles of liquid matter



Particles of gaseous matter



Modelling: is a way of presenting a simplified representation of objects that are either too tiny to be seen or too massive to be comprehended, which helps us to understand objects and the relationships between them.



Notes:

- Particles of the same substance are **identical**, and their types **differ** from one substance to another.
- There are attractive forces between the particles of matter, and they store **potential energy** (due to the attractive forces between them)
- The particles of matter are in **continuous motion** so it has kinetic energy (**this motion and speed differ according to the state of matter.**)
- There are distances between these particles that depend on the **physical state** of the substance.

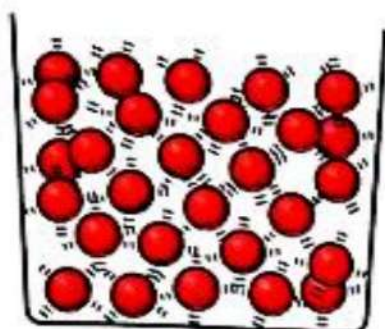


Interpterion of the properties of states of matter

Cause	Result
1-The attraction forces between the particles are very strong.	Particles of solid substance are tightly bound together, have a fixed shape and don't flow.
2-The distances between the particles are very small.	They have fixed volume and incompressible.
3-The particles vibrate in position without moving to other positions.	Diffusion through a solid is very slow

Give reason: Solids have a definite shape and volume.

Because the attraction force between their particles very strong and the distances between them are very small.



Liquid matter



Cause	Result
1-The attraction forces between the particles are relatively weak but sufficient to hold them together.	Liquid has no fixed shape, takes the shape of container and can flow.
2-The distances between the particles are relatively large.	They have fixed volume and incompressible.
3-The particles move relatively free.	Diffusion through a liquid occurs at an average speed.

Give reason: Liquids have an indefinite shape and definite volume.

Because the attraction force between their particles are relatively weak and the distances **between their particles are relatively large.**



Gaseous matter



Cause	Result
1-The attraction forces between the particles are very weak.	Gaseous substance has no fixed shape, takes the shape of container and can flow.
2-The distances between the particles are very large.	They have no fixed volume and compressible.
3-The particles move relatively free.	Diffusion through a gaseous substance is very rapid.

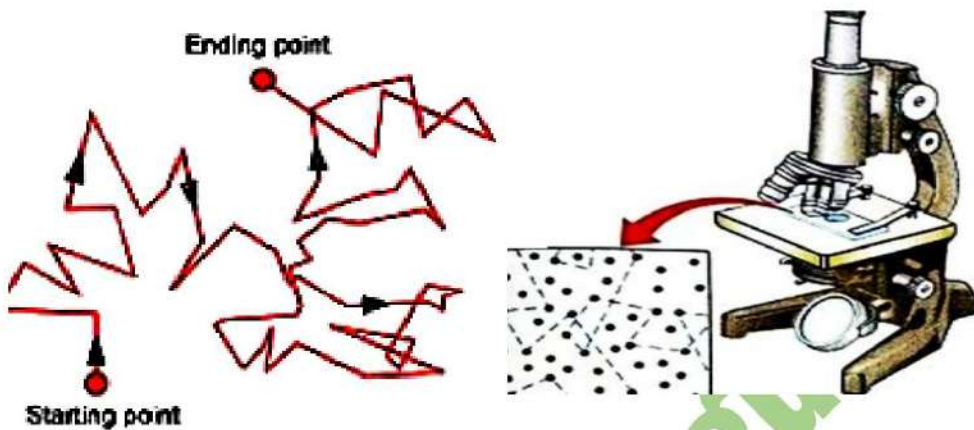
Give reason: Gases have no definite shape or volume.

Because the forces of attraction between their particles are very weak, and the distances between them are very large.



Brownian motion

Brownian motion: Random movement in all directions of relatively large particles suspended in a fluid as a result of their continuous collision with the particles of the fluid.



*-In 1827, the scientist Brown discovered that pollen grains suspended in water, they are in state of continuous random motion in all directions.

Give reason:

1- The difficulty of breaking a piece of rock.

Because it is a solid substance, its particles are bound by very strong attractive forces and, the distances between them are small.



2- Spreading smoke from a candle wick in the air.

Because air is gas, its particles are separated and move freely in all directions.

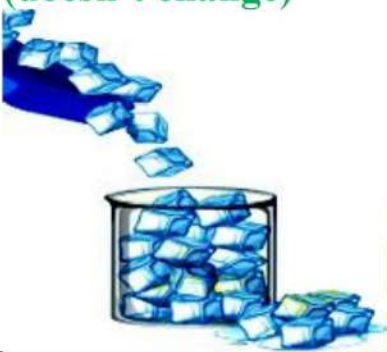


3- Dissolving a quantity of table salt in water.

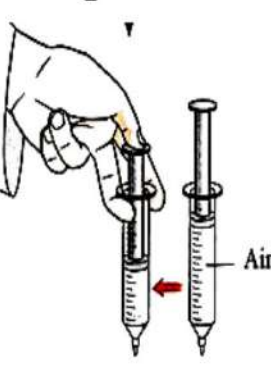
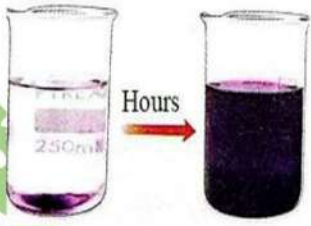
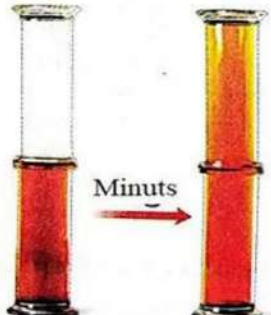
Because water is a liquid substance and its particles can penetrate between the salt particles and break the bonds between its molecules.

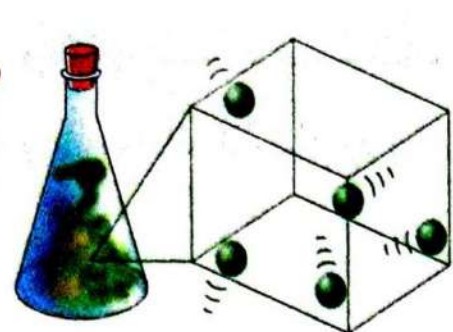
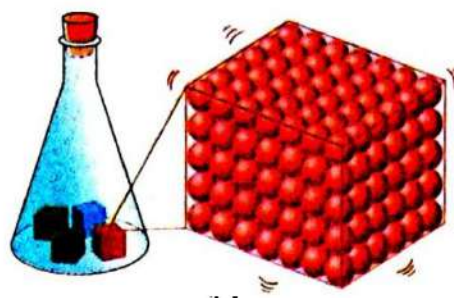
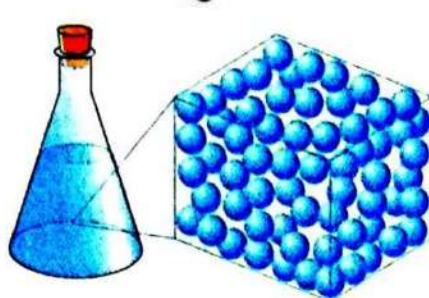


-Compare between the three sates of matter:

P.O.C	Solids	Liquids	Gases
Shape	Keep their shape (fixed), (doesn't change) 	Take the shape of container (change) 	Change to fill space. 
Attraction force	Very strong	Relatively weak	Very weak
Distances between molecules	Very small	Relatively large	Very large
Movement of particles	In their position only	Relatively locally	Freely and random
Flow ability	Don't flow 	Flow  Liquid	Flow easily  Gas
Volume	Fixed	Fixed	Not fixed



Compressibility	Not Compressible 	Not Compressible 	Compressible 
Diffusion speed	Very slow (Diffusion of dye in a sponge) 	Medium Diffusion of potassium permanganate in water 	Very fast Diffusion of bromine vapors in air 



Plasma state

Plasma state: It is the fourth state of matter, in which gases exist in the form of positively charged ions and negatively charged ions, when gases are heated very intensely (characterized by high electrical conductivity.)

Examples: Matter in space exists in the plasma state, such as in the sun, stars, cosmic nebulae, lightning and aurora borealis.



Technological applications:

Using plasma state in air conditioners (AC) to improve air quality in closed spaces where gases are passed through a high electric field to convert their atoms into positive ions and negative charged electrons, where charged gas ions work to break down harmful air pollutants, germs and viruses, this makes the air purer.



Worksheet (1)



Q.1) Give reason:

1- Solids have fixed shape and volume.

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2- Plasma is considered a good conductor of electricity.

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Q.2) What happens if :

1- Gases are exposed to strong electric fields.

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Q.3) Compare between the three states of matter :

According to: **Attraction force** **2- Flow ability**

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L. (2):- Change in the states of matter

Change in physical state of water when it gains thermal energy

When ice gains a quantity of thermal energy, the kinetic energy of its particles increases leading to increase in the temperature of the ice.

By continuous gaining of thermal energy

The force of attraction between particles weakens and at the melting point of ice (0°C), the ice turns into water and the temperature of ice and water remain constant until the ice completely melt.

By continuous gaining of thermal energy

The kinetic energy of the particles increases, leading to gradual increase in the temperature of water until it reaches the boiling point (100°C)

By continuous gaining of thermal energy

The forces of attraction between the particles weaken and the temperature of water and steam remain constant at (100°C) until the evaporation process is complete.



What happen when:-

Substance in one of its states gain thermal energy.

The kinetic energy of its particles increases, and its temperature rises.

The liquid continues to gain more thermal energy.

Its temperature rises gradually until it reaches the boiling point.

The liquid continues to lose thermal energy.

Its temperature decreases gradually until it reaches the freezing point.



Note

During the processes of melting and boiling, the temperature remains constant,

As the absorbed thermal energy weakens the attractive forces between the particles of the substance.

Melting point

It is the temperature at which matter changes from solid state to the liquid state.

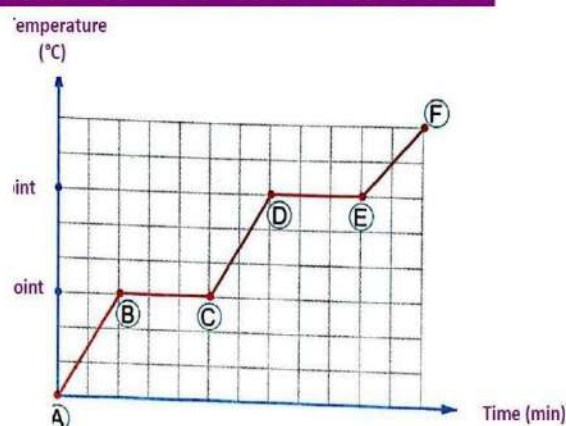
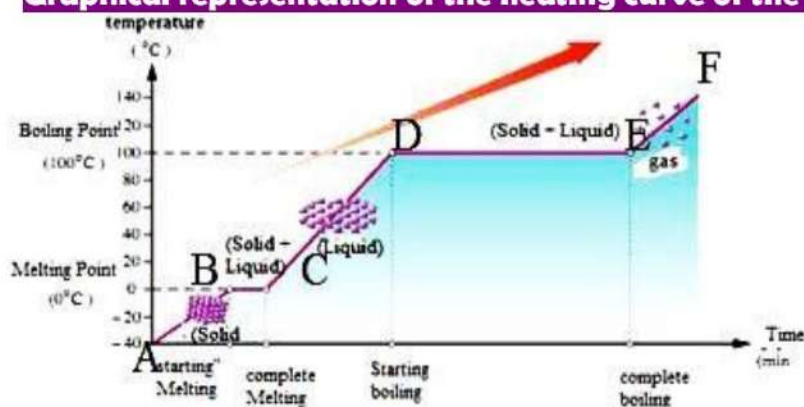


Boiling point

It is the temperature at which matter changes from liquid state to the gaseous state.



Graphical representation of the heating curve of the substance under certain conditions



Period	Analysis
AB	1) The substance is in a solid state. 2) The particles of the solid substance vibrate more in position, because of gaining thermal energy, which leads to an increase in its kinetic energy
BC	1) No change in temperature occurs from: B to C, because the absorbed thermal energy is consumed in weakening the forces of attraction between the particles of the solid until it completely transforms into the liquid state 2) The substance is in both solid and liquid states. 3) Point B or C represents the melting point of the substance.
CD	1) A rise in temperature occurs from: C: D 2) The substance is in a liquid state. 3) The speed of the particles of the liquid substance increases, because of gaining thermal energy which leads to an increase in their kinetic energy.
DE	1) No change in temperature occurs from D: E, because the absorbed thermal energy is consumed in weakening the attractive forces between the particles of the liquid substance until it completely transforms into the gaseous state. 2) The substance is in both the liquid and gaseous states. 3) Point (D) represents the boiling point of the substance.
EF	1) A rise in temperature occurs from: 2) The substance is in the gaseous state. 3) The speed of the particles of the gaseous substance increases, because of gaining thermal energy which leads to an increase in their kinetic energy.

Factors affecting melting and boiling point.

1- Atmospheric pressure.

2- Degree of purity of matter.

1- Atmospheric pressure

When the atmospheric pressure increases, boiling point increases above 100°C and freezing point decreases below 0°C .

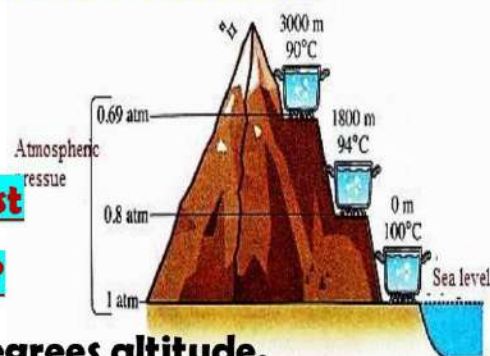
* At sea level (normal atmospheric pressure)

- Melting point of water (0°C).
- Boiling point of water (100°C)

* Above the sea level (atmospheric pressure decreases)

- Boiling point decreases by 1°C for each 300 m.
- Melting point increases.

What is the boiling point of water at the highest peak in the Alps, which is approximately 4800?



The temperature decreases by 1 for every 300 degrees altitude.

The temperature decrease = $4800/300 = 16$

The boiling point of water at the highest peak in the Alps = $100 - 16 = 84^{\circ}\text{C}$



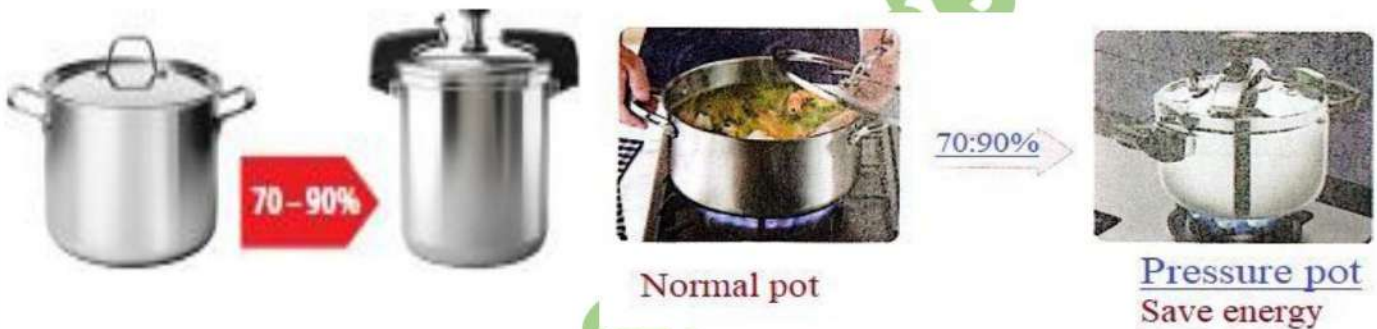
Technological Application: The Steam pot (pressure cooker)

Its importance

- Cooking food in less time compared to cooking in a regular pot to save fuel energy

How It Works?

Trapping water vapor inside during the cooking process leads to an increase in pressure and raising the boiling point of water above 100. This reduces cooking time and helps save fuel.



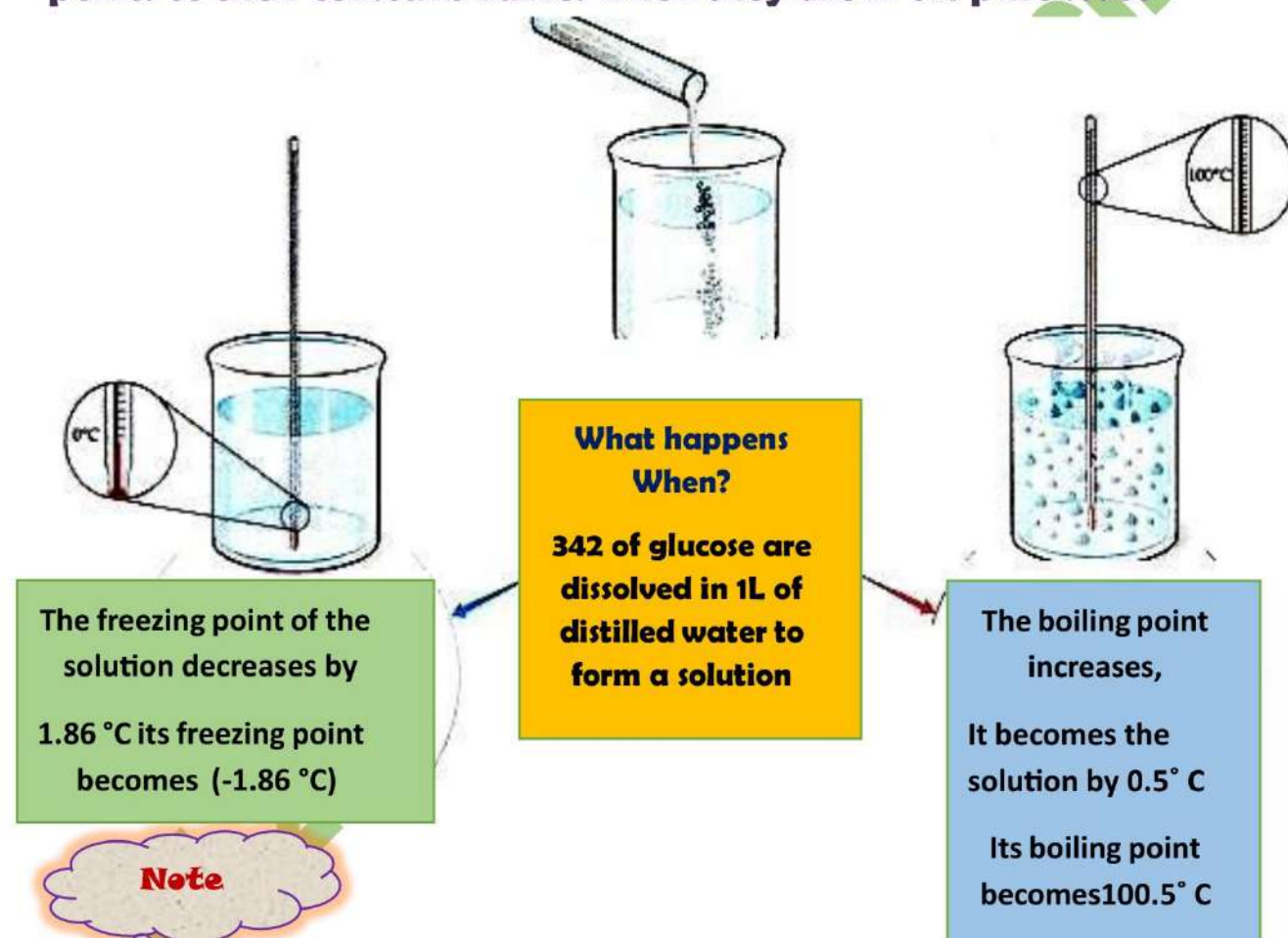
Electric pressure cookers



2- Degree of purity of matter

***Impurities affect attraction force between particles of pure substance.**

- Leading to change the amount of energy required to change the state of matter so, boiling and melting point change.
- The purity of substances is checked by comparing their boiling or melting points to their constant values when they are in the pure state



Note

- Each substance has constant melting and boiling point at normal atmospheric pressure.
- Changing degree of purity of substance affects melting and boiling point.
- When concentration of impurities increases boiling point increases and melting point decreases.

*Matter Transformations: (Reversible Processes)



1-By losing thermal energy as in condensation and freezing process.

Attraction force between particles increases, spaces between particles decrease.

Condensation process	Freezing process
- It is the change of matter from gaseous state to liquid state by losing thermal energy.	is the change of matter from liquid state to solid state by losing thermal energy.
Example: *Formation of water droplets on plants leaves in the early morning. *Formation of water droplets on cold surface	Example: Water freezes in polar regions to become ice.

2-By gaining thermal energy as in melting and boiling

attraction force between particles decreases, spaces between particles increase.

Boiling process	-Melting process
It is the change of matter from liquid state to gaseous state by heating .	It is the change of matter from solid state to liquid state by heating (gaining thermal energy) from surrounding medium.

Note

*Melting is the opposite of freezing.

*Evaporation is the opposite of condensation

GIVE REASON

Change of matter from one state to another is physical change.

Because there is no change in the structure of matter and no new substance is formed.

Reflexive process in transformation of matter.

1- SUBLIMATION

2- PRECIPITATION

Sublimation

It's the process of changing matter from solid state to the gaseous state without passing through the liquid state.

Example:

Solid iodine sublime into iodine vapor without passing through the liquid state.

Dry ice is carbon dioxide in solid state.

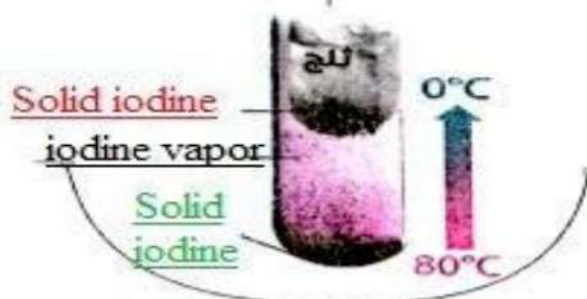
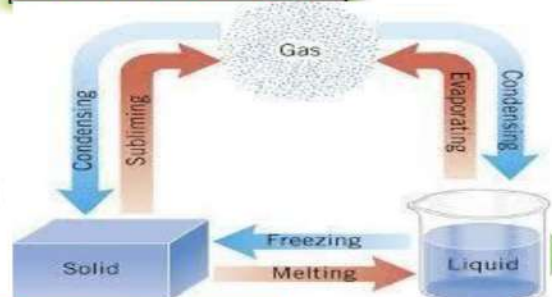
Precipitation

It is the process of changing matter from gaseous state to solid state without passing through the liquid state.

Example:

***Iodine vapor** precipitates upon cooling forming solid iodine without passing through the liquid state.

***Frost forms** on the surface of crops and cars when the temperature of water vapor in the air drops below 0°C .



What happens if:

Water vapor in air loses thermal energy.

Water vapor condenses in the form of cloud or fogs.

Difference between boiling and evaporation process

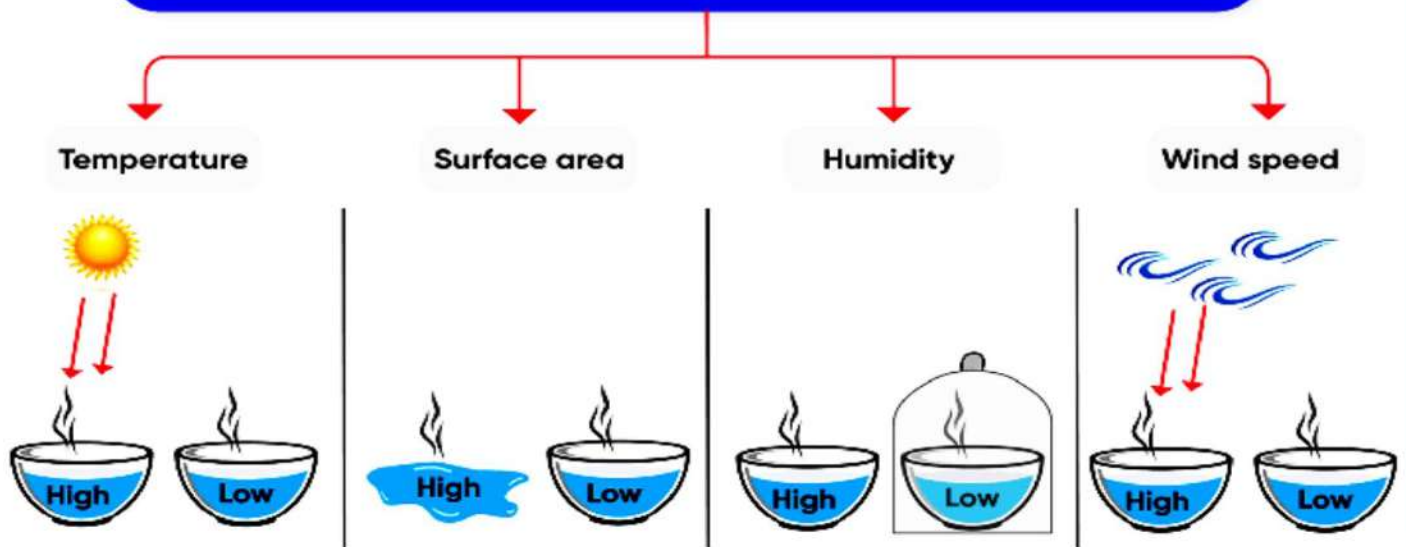
Boiling Process	Evaporation Process
	
1- The process of a substance changing from the liquid state to the gaseous state at a specific point (the boiling point). 2- It occurs to all molecules of the liquids. 3- It is carried out by thermal energy derived from a heat source 4- It takes a relatively short period of time. 5- It is accompanied by the formation of air bubbles (gas within the liquid)	1- The process of changing a substance from the liquid state to the gaseous state at any temperature below the boiling point 2- It occurs to the molecules on the surface of the liquid. 3- It is carried out by thermal energy derived from the surrounding medium or a heat source. 4- Takes a relatively long period of time. 5- It is not accompanied by the formation of air bubbles (gas inside the liquid).

Give reason

Boiling point is used to check purity of substances not evaporation.

Because boiling occurs at certain temperature for each substance, while evaporation occurs at any temperature

DIFFERENT FACTORS AFFECTING EVAPORATION



1-Temperature

When temperature increases, the rate of evaporation **increases**. the **kinetic energy increases** and energy of particles become sufficient to escape.

2- Surface area of

When surface area increases rate of evaporation **increases**, number of molecule that gain heat **increases** and be released from the surface.

3- Humidity

When humidity **increases**, rate of evaporation **decreases**.

4- Air current speed

When air current **increases**, rate of evaporation **increases**.

Give reason.



- 1- Wet clothes dry faster in the daytime ,
- 2- When the sun is shining than at night.

Because the evaporation rate of water increases when the temperature rises.



Life application

• Instant coffee

- -Why is it called instant coffee?
- Because it dissolves quickly in water compared to regular coffee

Method of production

It is manufactured by exposing sprayed concentrated coffee extract to extremely hot dry air

(around 250°C), where the increase in the surface area of the spray droplets exposed to hot air increases the rate of evaporation and the formation of solid instant coffee crystals.



Worksheet (2)



Give reason for each of the following :-

1- Matter changes from liquid state to gaseous state by heating.

.....

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2- At tops of mountain boiling point of water decreases below 100°C .

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3- Boiling point is used to check purity of substances not evaporation.

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4- Less fuel is consumed in the pressure pots.

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Lesson: (3)



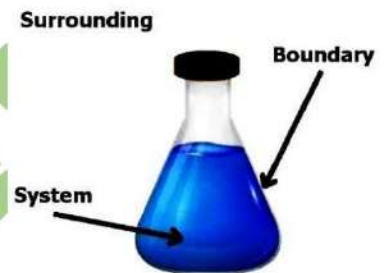
Internal energy and temperature

System:

Any part of the universe that is the subject of study and observation of changes in energy and matter

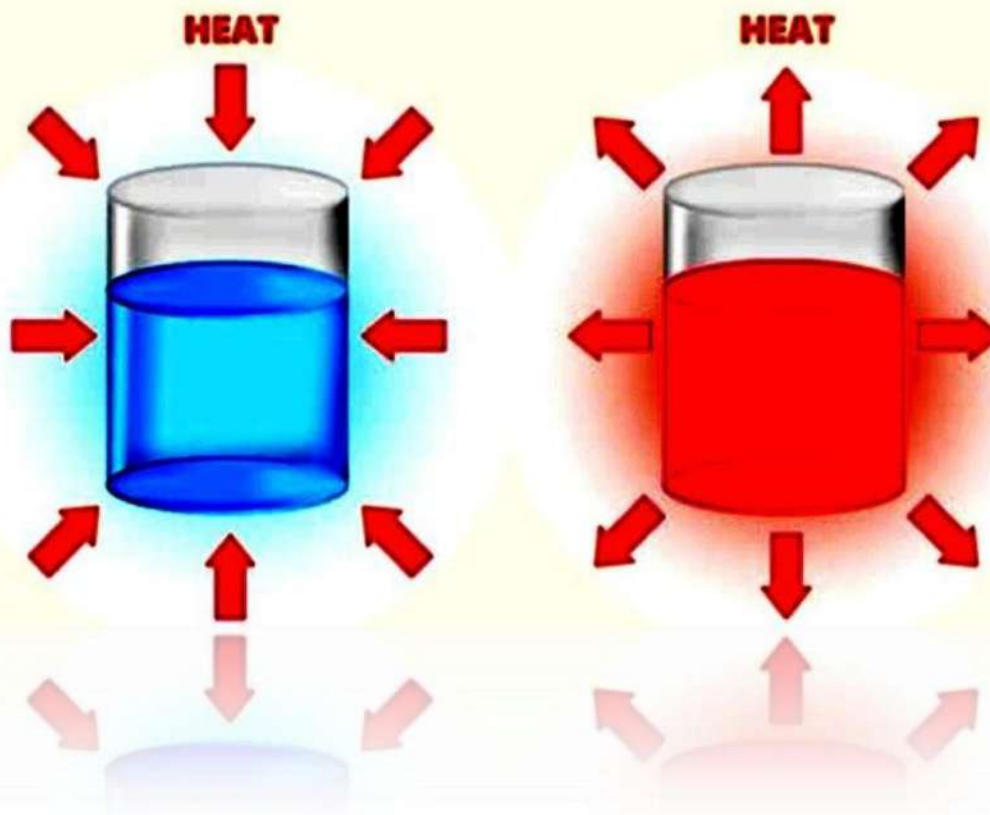
Surrounding:

The space surrounding the system with which it can exchange energy, matter or both.

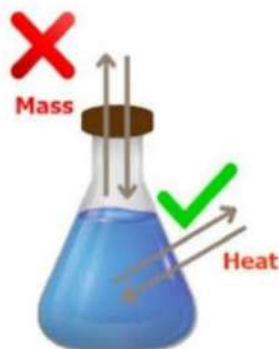
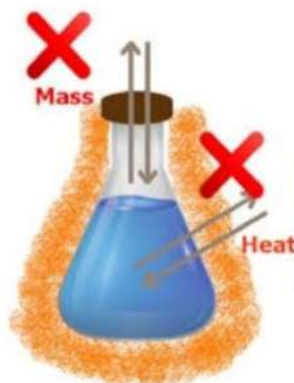


Note

Every system has a boundary that separates it from its surroundings.



Types of systems

Open system	Closed system	Isolated system
		
The system that allows the exchange of both matter and energy between the system and the surrounding medium.	The system that allows energy exchange only between the system and the surrounding medium.	It does not allow any transfer of energy or matter between the system and the surrounding medium.
<u>An open pot containing boiling water is (open system) G.R</u> Because heat and water vapor are exchanged with the air.	<u>A can of soft drink is (closed system) G.R</u> Because only heat is exchanged, without the exchange of matter with the air.	<u>A thermos (isolated system) G.R</u> Because no heat or matter is exchanged with the surroundings
		

Give reason:

A medical thermometer is considered a closed system.

-Because only energy is exchanged with surrounding in the form of heat.



The internal energy of the system



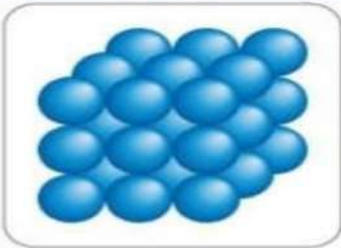
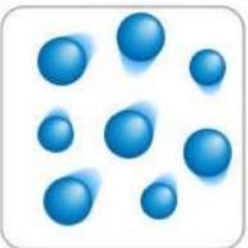
In the particle theory of matter:

-Any system consists of particles has potential energy and kinetic energy,
They differ according to state of matter.

The internal energy of the system:

Is the sum of potential energy and kinetic energy of any system.

The internal energy = potential energy + kinetic energy

P.O.C	Solid	Liquid	Gas
Shape			
Potential energy (PE)	<u>As high as possible..... why?</u> Because the force of attraction between particles are very strong and the distance between them are very small	<u>Medium....why?</u> Because the force of attraction between particles are relatively large and the distance between them are relatively large.	<u>Almost zero....why?</u> Because the force between particles are very weak and the distance between them are very large
Kinetic energy (KE)	<u>Small.....why?</u> Because it's particles only vibrate around their position	<u>Medium.....why?</u> Because it's particles move relatively freely in their container	<u>Very high.....why?</u> Because its particles move completely freely.

Note:



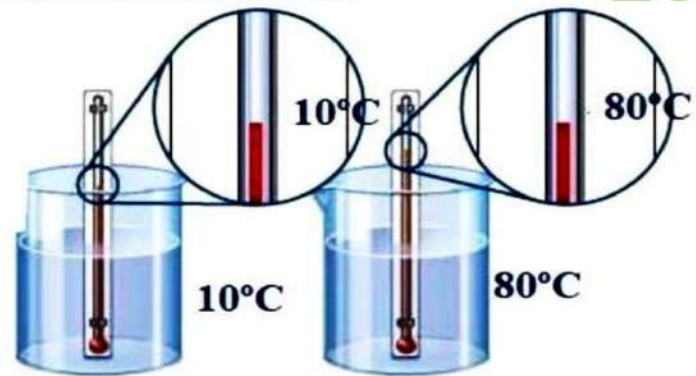
-The internal energy of a system increases, by increasing the potential energy of particles, kinetic energy of particles or both.

The internal energy depends on:

1- Potential energy

2- Kinetic energy

Temperature



-The **average kinetic energy** of the particles of the system.

- It represents the degree of **hotness** or **coldness** of any systems.

Average kinetic energy of particles of a system =

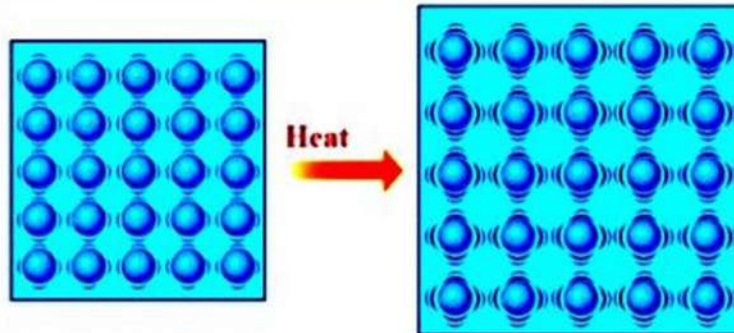
$$\frac{\text{Total kinetic energy of the particles}}{\text{number of particles}}$$

Note:

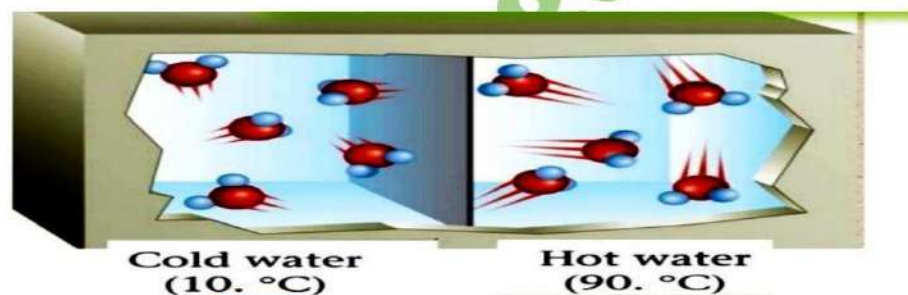
1-The average kinetic energy of the particles of a system is equal to the kinetic energy of a single particle when the kinetic energy of all particles is equal.



2-When a substance (system) **gains** an amount of **thermal energy**, the **average kinetic energy** of its particles **increases**, leading to an **increase** in the **temperature** of the system and vice versa.



3- The internal energy of water particles increases when it gains thermal energy.

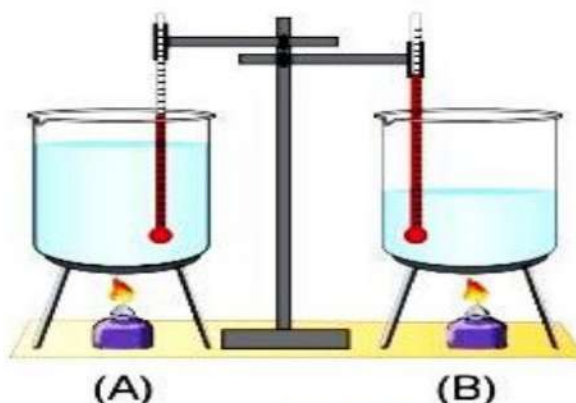
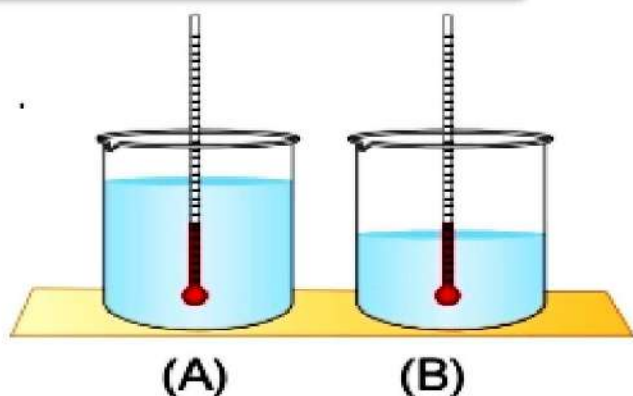


Factors affecting the change in temperature of objects:

- 1- Mass of the substance.**
- 2- Type of the substance.**
- 3- State of the substance.**



1-Mass of substance



1. Place 1 kg of water in beaker (A) and $\frac{1}{2}$ kg in beaker (B).
2. Record the temperature of the water in each beaker using a thermometer.

3. Heat each of the beakers over a regular flame.
4. Record the temperature of the water in each beaker at equal intervals.

Observation

The temperature of the water in beaker (A) = the temperature of the water in beaker (B) despite their different masses.

The temperature of the water in beaker (B) is higher than in beaker (A).

Conclusion

The amount of change in temperature of different masses of the same substance differs when they gain or lose the same amount of thermal energy.

Variables

Control variable: the heating time (amount of heat gained), according the type of substance.

Independent variable: the mass of the water in the two beakers.

Dependent variable: the amount of change in temperature.

Explanation

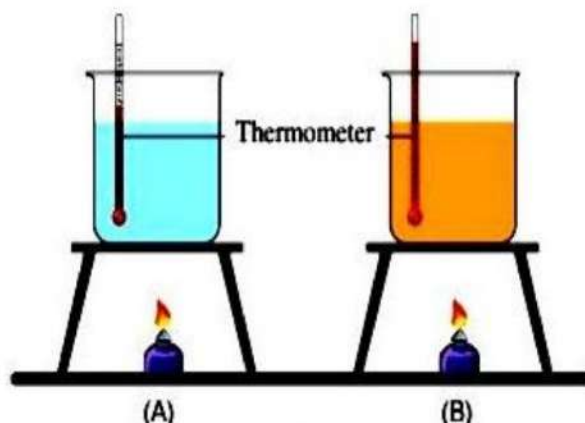
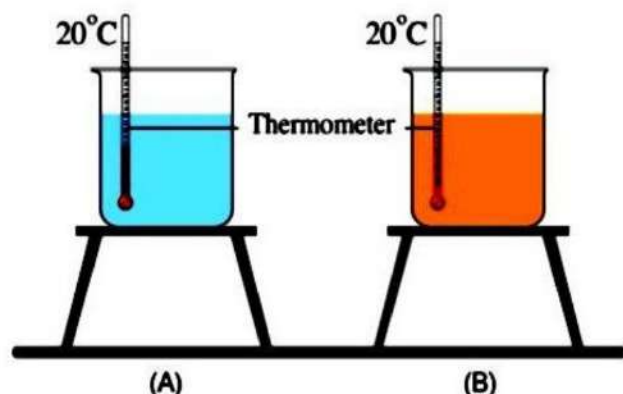
1-The temperature increases by a greater amount when the mass decreases... Why?

Because the thermal energy gained by the substance is distributed over a smaller number of particles, its average kinetic energy increases by a greater amount.

2- The amount of temperature increase for a single substance decreases with an increase in its mass... Why?

Because the thermal energy gained by the substance is distributed over a larger number of particles, its average kinetic energy increases by a smaller amount.

2- Type of the substance



Steps :

1-Place 1 kg of water in beaker (A) and 1 kg of oil in beaker (B).

2-Record the temperature of the water and oil in each beaker using a thermometer.

3-Heat each of the beakers over a regular flame until the heating time becomes a measure of the amount of heat gained by the water

4-Record the temperature of the water in each beaker at equal intervals.

observation

The temperature of water in beaker (A) = the temperature of oil in beaker (B) despite their being of different types.

The temperature of the oil in beaker (B) is higher than the temperature of the water in beaker (A).

The amount of change in the temperature of equal masses of different materials drifts when they gain or lose the same amount of thermal energy

Explanation

When two equal masses of oil and water are heated by the same heat source for the same period of time, the temperature rise in the oil is greater than that in the water...Explain?

Because the specific heat of the oil is less than the specific heat of the water

Control variables:

- 1-The mass of oil and water
- 2-The amount of heat gained

Independent variable

The type of material used

Dependent variables:

The amount of change in temperature.

Specific heat:



The amount of heat required to raise the temperature of 1 Kg of substance by 1°C

Measuring unit: $\text{J} / \text{Kg}^{\circ}\text{C}$

What is the meant by that the specific heat of iron is 4500J ?

It mean that the amount of heat required to raise the temperature of 1 kg of iron by 1°C is 450 J

Opposite table shows the values of specific heat for some substances:

The substance	Mercury	Copper	Iron	Aluminum	Corn oil	Ice	Water
Specific heat ($\text{J/kg}^{\circ}\text{C}$) (at room temperature)	140	385	450	900	2000	2090	4180

Specific heat is a characteristic property of a substance or varies depending on:

- 1- The type of substance
- 2-The physical state such as the difference between the specific heat of ice and liquid water

Note:

1- The amount of heat required to **raise** the temperature of **1Kg** of water by **1°C** is **greater** than that of **any substance**.

2-When the specific heat of a substance **is large**, the amount **of heat required** to raise the temperature of a substance **by 100°C is large** (and vice versa).

3-The material takes **a long time to lose** the energy it gained (i.e., it **cools slowly**) and vice versa.

3- State of substance:



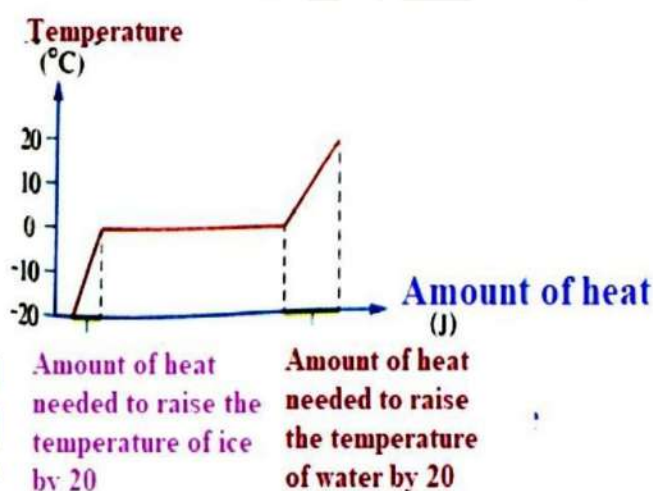
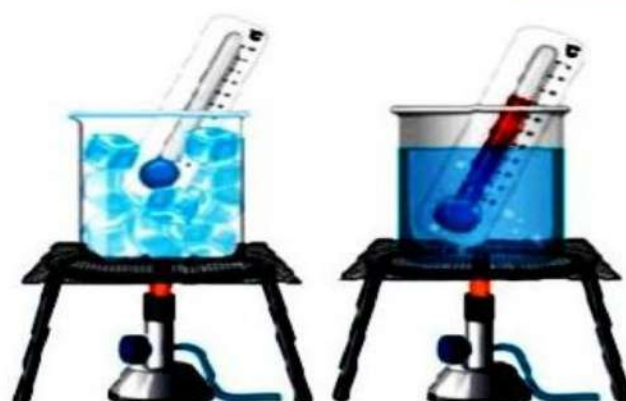
Steps

1 -Place 500 g of water 20 °C in one beaker and 500 g of ice (-5 °C) in other beaker.

2-Heat each beaker by regular flame for two minutes.

3-Record the thermometer Readings for both the water and the ice and

4- Calculate the amount of the change in their temperatures.



Observation

The amount of temperature increase in the ice (solid) is greater than the amount of temperature increase in the water (liquid).

Explanation

The amount of temperature increase in a block of ice is greater than e amount of temperature increase in the same mass of water when they gain the Same amount of thermal energy.

Explain?

Because the specific heat of ice is less than the specific heat of water.

Conclusion

The amount of temperature change of equal masses of different states of the same substance differs when they gain or lose the same amount of thermal energy.

Control variable

Amount of heat gained, mass of the substance.

Independent variable

Physical state of the substance

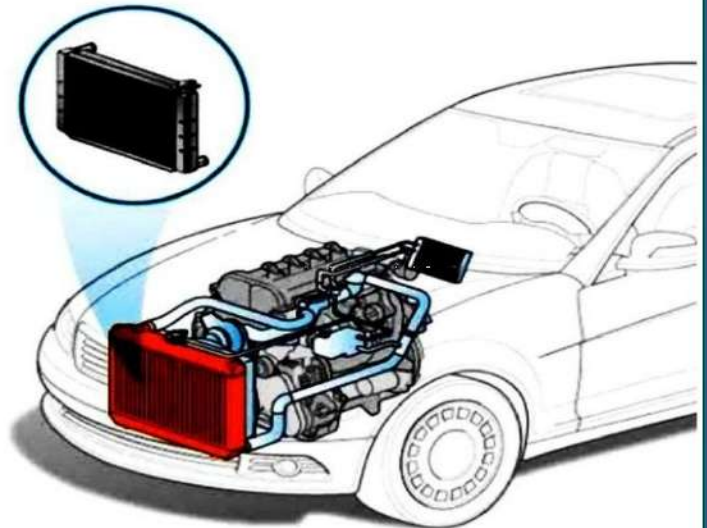
Dependent variable

Amount of temperature change.

Life application

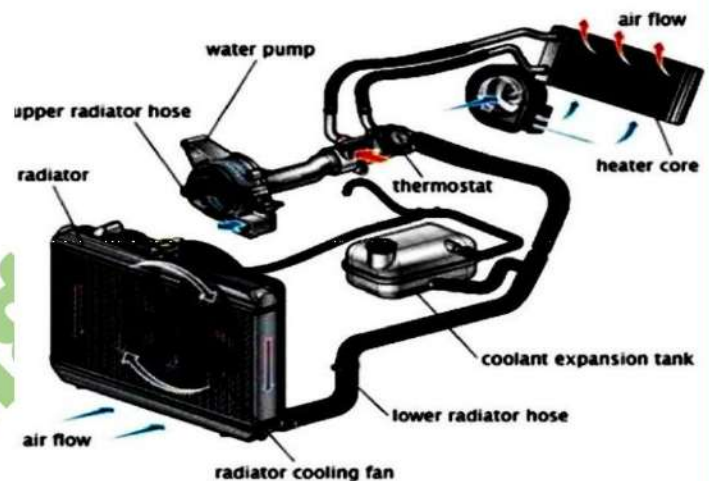
Radiator

-Water is an **excellent cooling liquid**. Because of its **high specific heat**, it absorbs large quantities of heat energy without a significant increase in its temperature



-Water is used in the cooling system connected to car engines, known as the radiator?

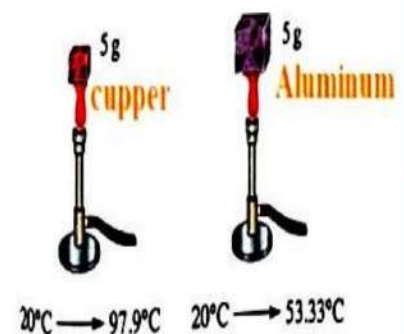
To protect them from damage.



Give reason:



1-When two equal masses of copper and aluminum gain the same amount of heat, the temperature rise in the copper is greater than the temperature rise in the aluminum, Explain?



-Because the specific heat of copper is lower than that of aluminum, copper is thermally preferred over aluminum in the manufacture of heating utensils.



2- Mercury IS used in the manufacture of thermometers?

-Because the specific heat of mercury is low, and therefore its temperature rise quickly when any amount of heat is gained.

3- Water constitutes a large percentage of the human body?

-Because the specific heat of water is high, and therefore it maintains a constant body temperature when the temperature of the surrounding medium changes.

4-Water is an excellent cooling fluid?

-Due to its high specific heat, it absorbs large amounts of thermal energy without a significant increase in its temperature.

5-You have two quantities of water and oil with the same mass at a temperature of 20°C . They were heated by a heat source. Which of the two liquids takes longer to reach a temperature of 60°C ? Explain

Because water takes longer to raise its specific heat than the specific heat of oil.

Note:

The material which is used in making ice boxes, must takes a long time to lose heat.

Worksheet (3)



Question (1):

Compare between two equal masses of asphalt and water exposed to the sun for the same period of time, in terms of:

1) internal energy

2) temperature

P.O.C	Asphalt	Water
Internal energy		
Temperature		

Question 2:

Three different quantities of water were heated in three identical containers the graph below shows the time taken by each quantity to reach boiling point:

1) Which of these containers contains the least amount of water?

2) What is the independent variable and what is

the controlled variable in this experiment?

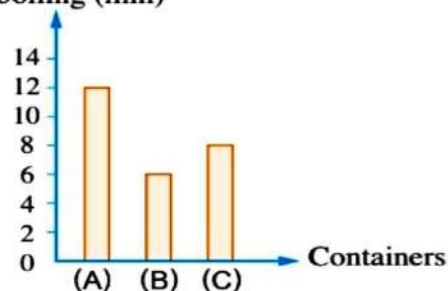
1-

.....
.....

2-

.....
.....
.....

Time required for boiling (min)



Question (3):

Give one example of the following:

1- Open system.

.....

2- Closed system.

.....

3- Isolated system.

.....

Question 4:

Give reason for the following:

1- Water makes up a large percentage of the human body.

.....

.....

2- Mercury is used in manufacture of thermometer.

.....

.....



Lesson (4)

Methods of heat transfer

Heat

- Energy that is transferred from one system to another or to the surrounding, due to a difference in temperature.

Notes:-

- Heat flow means the movement of thermal energy from a hot object to cold one .
- **Give reason:** A pot of boiling water (100°C) in a room (25°C) the water cools down ?
Because heat moves from the hot water to cooler room.

❖ Practical Activity (How heat flows ?)

Steps	Observations
1-Measure the temperature of cold water (20°C)	Water temperature increases $20^{\circ}\text{C} \longrightarrow 28^{\circ}\text{C}$
2-Heat some metal balls in boiling water until they reach (100°C)	Metal balls temperature decreases: $100^{\circ}\text{C} \longrightarrow 28^{\circ}\text{C}$
3-Put the hot balls into the cold water and measure the new temperature	Final temperature (equilibrium) = 28°C

Notes :

- Water heats up slowly.
- Metal balls cool down quickly.
- **Reason:** the specific heat of water is greater than the specific heat of metal.

❖ Thermal Equilibrium :-

- When two objects at different temperatures come into contact:
 - Heat flows from the hot object to the cold object.
 - Flow continues until both reach the same temperature.

Thermal Equilibrium

- Is the state when two systems in contact reach to the same temperature.

➤ Important :

- Heat lost by the hot body = heat gained by the cold body

➤ Examples :

- 1-Object (50 °C + object (30 °C) —————> both reach (40°C)
- 2- Object (30 °C)+ Object (30 °C)—————> No heat transfer .
- 3-Cup of Nescafe (70°C) + Milk (20 °C)—————> The final temperature is between 70 °C and 20 °C

+ Notes :-

- Heat transfer stops when thermal equilibrium is reached.
- The rate of change depends on the specific heat capacity of the material, differ in mass and type.

Don't forget

Specific heat capacity:

The amount of heat energy required to raise the temperature of (1 Kg) of a substance by 1°C

- This means that each material has a different ability to retain or absorb heat . this ability called specific heat capacity .



Methods of heat transfer

Conduction

Convection

Radiation

❖ First : Heat transfers by conduction :-

Conduction

- Heat is transferred through **solids** from the hot side to the cold side.

➤ How it works :

Metal rod is **heated**

The particles (atoms) **gain kinetic energy**

Particles **vibrate faster** and collide with neighbors particles

These neighbors **gain energy** and pass it on to the next ones

Heat moves without particles leaving their position.

Thermal conductivity

- A measure of the extent to which a material conducts heat trough it.**

➤ Classification of materials :

P.O.C	Thermally conductive materials	Thermally insulating material
Definition	Good thermal conductors have high thermal conductivity	Poor thermal conductors have low thermal conductivity
Examples	Diamonds – All Metals	Wood – plastic- cardboard



✓ What happen if :

✓ Two rods (copper and iron) with wax and pins are heated ?

Pins on copper fall faster, because copper conducts heat better than iron

✓ Give reason:

✓ 1-Pizza is placed in cardboard boxes.

To keep it hot, because cardboard is a heat-insulating material.

2-The presence of cooling systems inside electronic devices such as computers and smartphones that use materials that conduct heat well such as silver ?

To get rid of heat generated in the internal components, which may lead to poor performance and possibly damage.

❖ Second : Heat transfer by convection :-

Convection

- It is the transfer of heat in liquids and gases by the movement of their particles.

□ How it works (in water)?

1. When water near the bottom is heated, particles gain energy.

↓
move faster

↓
become less dense.

2. Hot water rises up.

3. Cold water (more dense) moves down to take its place.

4. This continuous movement forms convection currents.

How it works (in air)

- 1-When air is **heated**, its density **decreases** → **rises** (moves up) .
- 2-When air is **cooled**, its density **increases** → **sinks** (moves down) .

Examples

1. **Heater at floor of room:** Warm air rises, cold air sinks.
2. **Freezer at top of refrigerator:** Cold air sinks, warm air rises.
3. **Sea Breeze:**
 - During the day, land heats faster than sea.
 - Warm air above land rises, replaced by cold air from sea.



Sea Breeze

The movement of cold air (breeze) from the sea during the day towards the land.

✓ Give reason:

The reason for sea Breeze occurrence.

The specific heat of land is lower than the specific heat of sea water.

✚ Note :

- The effect of the sea Breeze phenomenon is **more** evident in the **summer** than in the **spring or autumn**



How can an eagle fly in the air at great heights?

The air near the Earth's surface is heated by the sun.



The warm air becomes lighter (less dense) and rises upwards.

The eagle spreads its wide wings to rise with the warm air currents without flapping its wings.

The upward force of warm air balances the force of gravity,
So the eagle can stay high in the sky easily

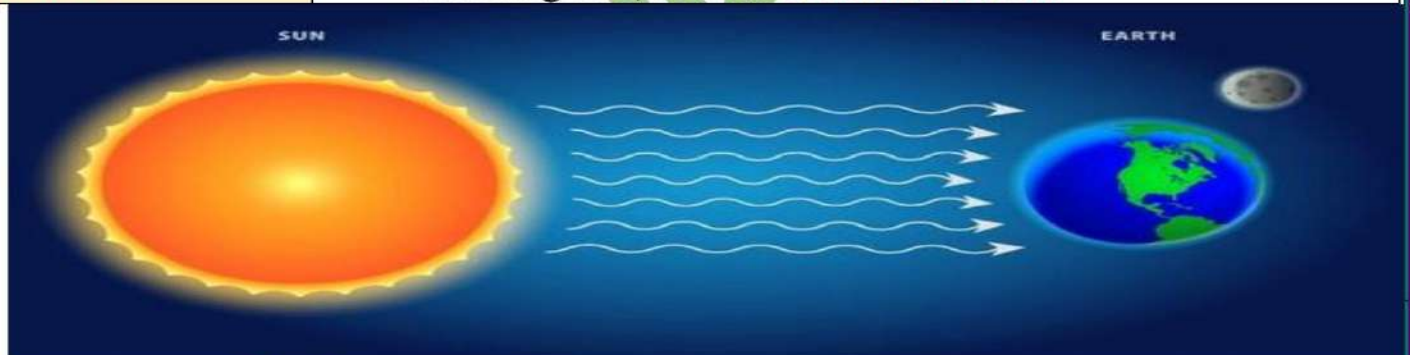
☀ Third : Heat Transfer by Radiation:-

Radiation

- It is the transfer of heat energy in the form of electromagnetic waves (such as light and infrared) **without the need of particles or a medium.**
- Heat is transmitted by radiation in a **vacuum** and in **gases**

Electromagnetic waves

- Waves that propagate in a vacuum at a very high speed, reaching 300,000 m/s **in all directions**



✚ Notes :-

- Heat from the sun reaches Earth by **radiation through space.**
- **All hot objects radiate heat (infrared rays).**
- **The hotter the object, the more infrared radiation it emits.**
- **Solar radiation consists of many electromagnetic waves.**





Examples & Applications:

1. Heat transfer from a lamp to the hand.
2. Solar water heaters are painted black to absorb radiation.
3. Clothes:

In the Summer	In the Winter
Wear white / light clothes (reflect radiation).	Wear dark clothes (absorb radiation).

4. Firefighters wear shiny uniforms to reflect heat.

Thermal radiation	The transmission of infrared rays from the surfaces of objects, especially hot ones, without the need for material particles.
--------------------------	---

Thermography	- A technology using special cameras to detect thermal radiation and convert it into colored images. ➤ The thermograph camera is used : 1-Photography in dark. 2- Detecting body temperature 
---------------------	--

□ Biology Integration

✓ Snakes can hunt prey at night ? (G.R)

Because sensors in their heads detect infrared radiation from warm bodies.



Worksheet (4)

Q.1) Write the scientific term :-

- 1) The energy that transfer from one system to another as a result of the difference in their temperature. (.....)
- 2) The state in which 2 different systems differ in their temperature and touching each other where their temperature becomes equals. (.....)
- 3) A Technique in which a camera use the sense of thermal waves emitted from bodies and change it into colored photos. (.....)

Q.2) What is meant by:

(1) Heat:

.....

(2) Thermal equilibrium

.....

(3) Sea breeze

.....

.

Q.3) Give reason :-

1-It is preferable to place an electric heater on the floor of a room.

.....

2- The sun's heat is transmitted to us by radiation.

.....



Model answer

Worksheet (1)



Q.1) Give reason :

- 1- Because the attraction force between their particles very strong and the distances between them are very small.
- 2- Because gases exist in the form of positively charged ions and negatively charged ions.

Q.2) What happens :

- 1- It changes into plasma state and changes into positive ions and negative electrons.

Q.3) Compare between the three states of matter :

Look at page (11)



Model answers for worksheet (2)



- 1- By gaining thermal energy, kinetic energy of particles increases attraction force between particles decreases, spaces between particles increase and matter changes from liquid state to gaseous state..**
- 2- Because at the top of mountain atmospheric pressure decreases and boiling points decrease by 1°C for each 300 m .**
- 3- Because boiling occurs at certain temperature for each substance, while evaporation occurs at any temperature.**
- 4- as Trapping water vapor inside during the cooking process leads to an increase in pressure and thus raising the boiling point of water above 100. This reduces cooking time and helps save fuel.**

Worksheet (3)



Question (1):

	Asphalt	Water
Internal energy	 more	 less...
Temperature	 greater..... Because the specific heat is less	 less..... Because the specific heat is more

Question (2):

1-.....container (B).....

2- Independent variable is the quantity of water.

Controlled variable : identical container and start temperature.

Question (3):

1- Open pot containing boiling water.

2- Can of soft drink.

3- Thermos.

Question (4):

1-Due to its high specific heat, it absorbs large amount of thermal energy without a significant increase in its temperature.

2-Because the specific heat of mercury is low, and therefore its temperature rise quickly when any amount of heat is gained.

Worksheet (4)



Q.1) Write the scientific term :-

- 1- Heat
- 2- Thermal equilibrium
- 3- Thermograph

Q.2) What is meant by:

- 1- Energy that is transferred from one system to another or to the surrounding due to a difference in temperature .
- 2- Is the state when two systems in contact reach the same temperature .
- 3- The movement of cold air (breeze) from the sea during the day towards the land

Q.3) Give reason :-

- 1- By transferring heat from the heater to the air next to it, the warm, less dense air rises upwards and the cold, denser air sinks downwards
- 2- Sun's heat is transferred to us without the need for material particles





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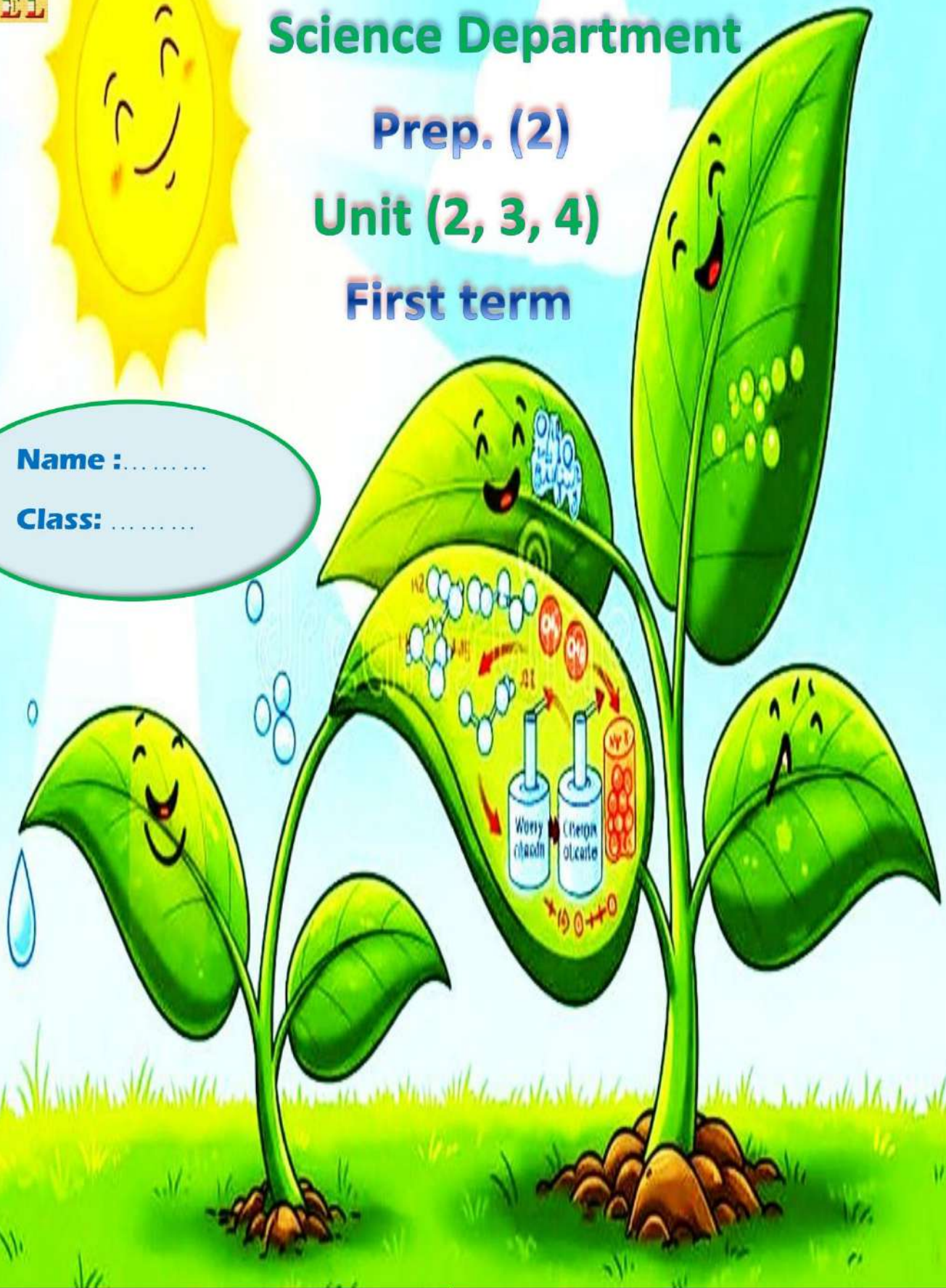
Prep. (2)

Unit (2, 3, 4)

First term

Name :

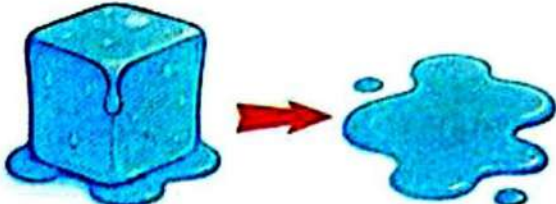
Class:



UNIT (2)



Lesson (1): Chemical Reactions

Physical Changes	Chemical Changes
It is a change in the state or shape of matter without changing its chemical composition. - Melting of ice - Dissolving sugar in water - Dissolving salt in water - Melting of wax. - Cutting paper 	It is the change that results in new substances with different chemical properties from the original materials. - Burning of wood - Rusting of an iron nail. - Milk turning into yogurt - Burning of wax. - Burning a piece of bread in the oven. - Clouding of clear limewater when carbon dioxide gas is passed through it 

Give reason:

-Clouding of clear limewater when carbon dioxide gas is passed through it is considered chemical change.

→ Due to the chemical reaction and the formation of a new substance that insoluble in water .

- Change in the color of a moistened universal indicator strip when exposed to ammonia gas is considered chemical reaction.

→ Due to the chemical reaction and the formation of a new substance that has different color.



CONCEPT OF CHEMICAL REACTIONS :

Activity (1) :

Materials and Tools Used:

Baking soda (sodium bicarbonate) - Vinegar (diluted acetic acid) – Balloon - Funnel - Empty bottle

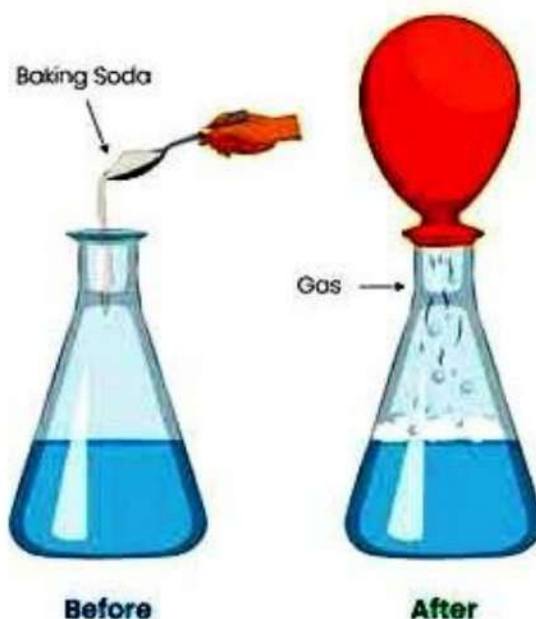


Steps	Observation	Explanation
1- Put two spoons of baking soda into the balloon.	Effervescence occurs and gas bubbles rise, causing the balloon to expand and fill with gas	The chemical reaction between baking soda (sodium bicarbonate) and vinegar (diluted acetic acid) results in effervescence and the release of carbon dioxide gas.
2- Pour some vinegar into the bottle.		
3- Insert the balloon's mouth into the bottle's mouth.		
4- Lift the balloon to pour the baking soda into the bottle.		

Without Baking Soda



With Baking Soda



Mechanism of chemical reactions

➤ Chemical Reaction

A process that involves the transformation of:



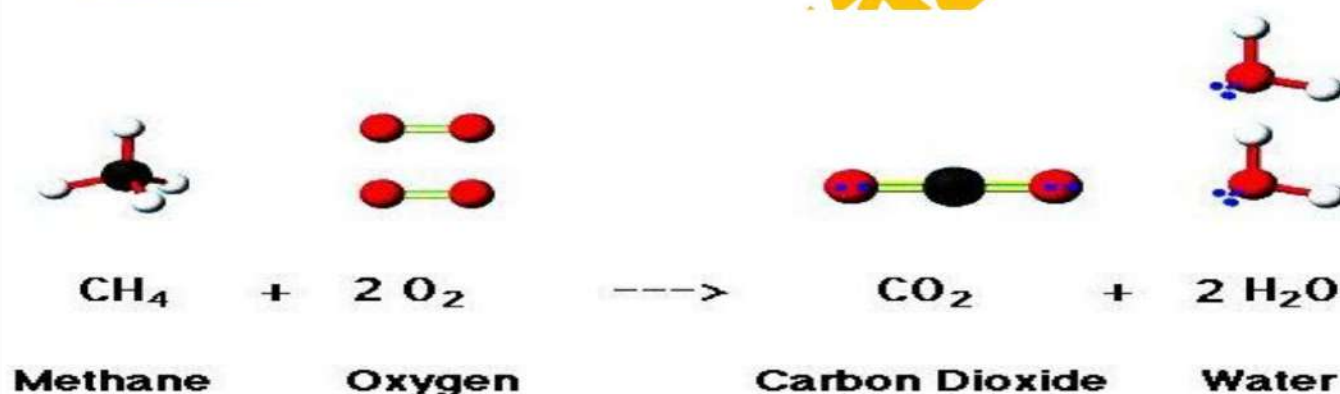
In a chemical reaction, the reactants combine, decompose or are replaced by new reactants to form new products.

Step 1:

Breaking the bonds between atoms in the molecules of the reactants.

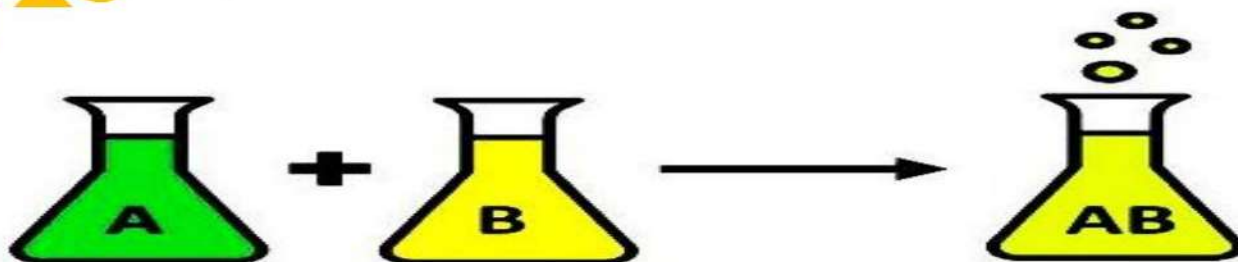
Step 2:

Rearranging the atoms and forming new bonds to create the products.



Combustion Reaction

➤ **Chemical reaction:-** It is the process of breaking the bonds between atoms in the molecules of the reactants and formation of new bonds between atoms in the molecules of the products.





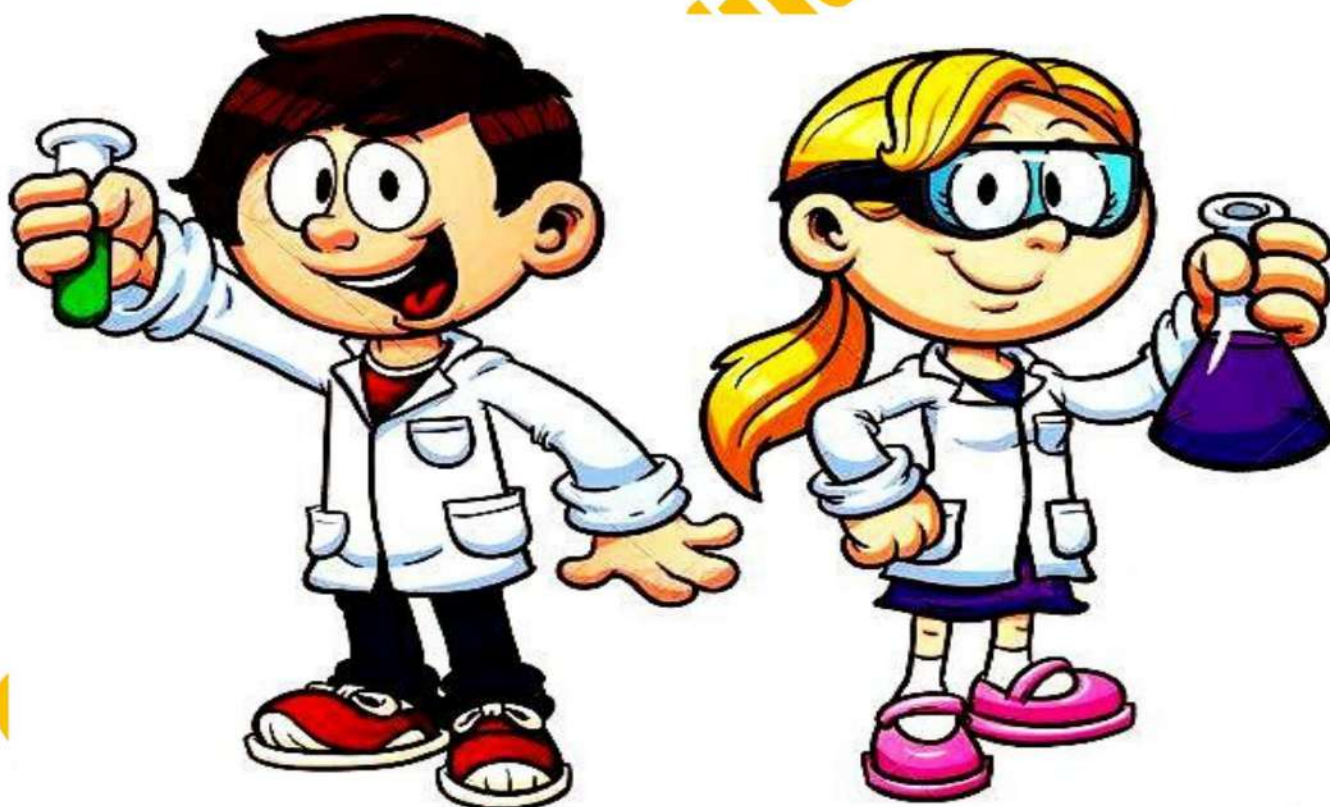
indicators of the occurrence of a chemical reaction

Formation of a precipitate

Colour change

Evolution of gas

Emission of light and heat



Indicators	Chemical Reaction	Evidence of chemical reaction
1-Formation of a precipitate	Adding silver nitrate solution (AgNO_3) to sodium chloride solution (NaCl) 	A white precipitate of <u>silver chloride (AgCl)</u> forms, which is insoluble in water and settles at the bottom of the container. 
2. Gas Evolution	Adding diluted hydrochloric acid (HCl) to a strip of magnesium (Mg) 	Bubbles of <u>hydrogen gas</u> are formed 
3.Change in color of the substance	Placing a zinc plate (Zn) in copper (II) sulfate solution (CuSO_4) 	→ The <u>blue color</u> of the copper sulphate solution <u>disappears</u> , forming a <u>colorless zinc sulphate solution</u> , and <u>red copper precipitates</u> on the zinc plate. 
4.Emission of light and heat	Burn a strip of magnesium (Mg) in atmospheric air 	<u>Mg strip turns into magnesium oxide (MgO) white powder</u> , which is soluble in water. 

➤ What indicates a chemical reaction when baking soda reacts with a diluted acid like H_2SO_4 ?

➡ Emission of carbon dioxide gas bubbles



- What indicates a chemical reaction when sodium hydroxide (NaOH) solution reacts with copper chloride (CuCl_2) solution?

→ A blue precipitate of copper hydroxide is formed that is insoluble in water.



- What indicates a chemical reaction when an orange goes rotten ?

→ The color changes to dark greenish and a bad smell is released.



- How can you distinguish between copper sulfate and ferrous sulphate when adding sodium hydroxide separately?

→ Precipitate difference: a blue precipitate of copper hydroxide and a green precipitate of iron (II) hydroxide are formed.

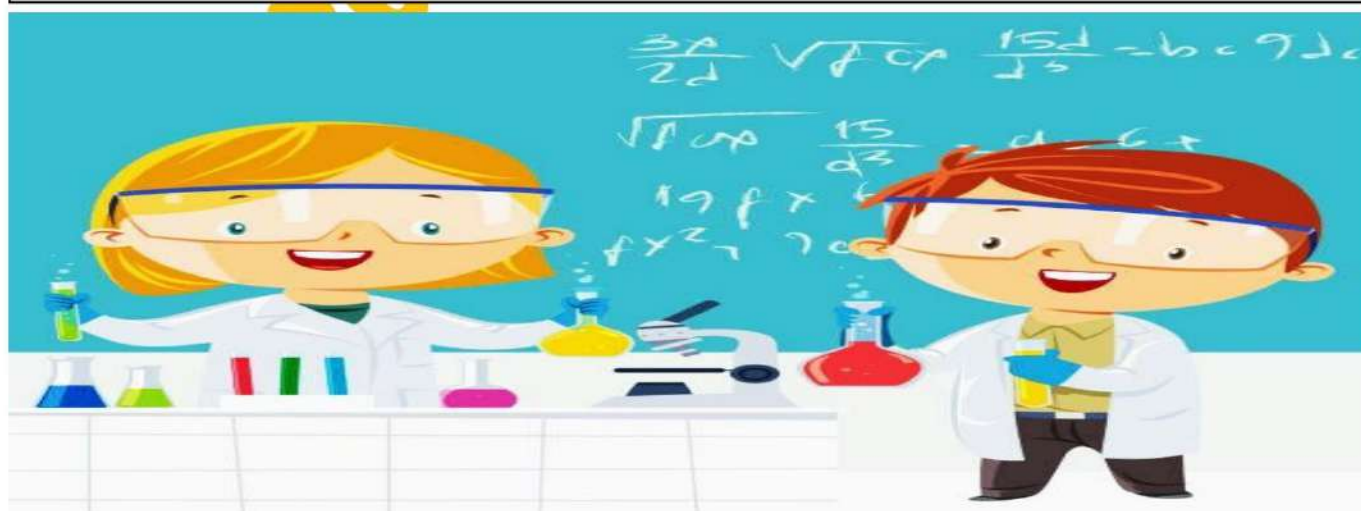


Do the following change indicate a chemical reaction? How can this be

- A glass bottle filled to the brim with water and tightly closed is broken when placed in the freezer of the fridge.



No, because the expansion of water during freezing does not result in a change in the chemical composition of the water or the glass.



NOTE: When a reaction occurs , it leads to the formation of :
precipitate, a change in color, the release of a gas, the emission of light and heat, the extinguishing of a burning match stick, or the increase in the glow of a burning splinter.

Laboratory safety precautions :

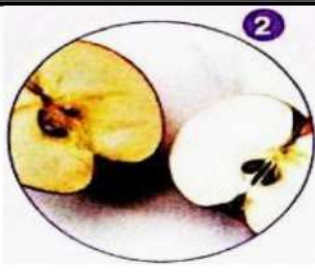
1. Wearing a protective mask.
→ To avoid the harmful effect of bright light.
2. Do not touch the white powder formed after burning magnesium ribbon.
→ Because it will be hot.
3. Hold the magnesium strip with heat-resistant tongs.
→ To avoid burns during burning.
4. Handle acids carefully with extreme caution,, especially concentrated acids.
→ Because they are very dangerous.

Chemical reaction in life

1- When eggs are fried, a chemical reaction occurs, causing a change in the colour and texture of both white and yellow parts.



2. Reaction of oxygen in the air with apple slices causing the apple to turn brown.



3. Rusting of Iron when exposed to oxygen in moist air.



4. Fireworks reaction causes the emission of light and heat.



Evidence of a chemical reaction



The Properties of substances before and after chemical

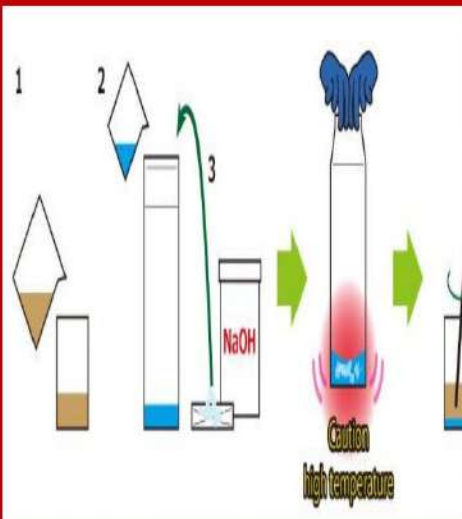
➤ ACTIVITY 1: BURNING SUGAR

Steps	Observation	conclusion
1. Put a quantity of table sugar in a spoon.	-The sugar turns into a brown molten color and begins to burn.	When molten sugar burns, a chemical reaction occurs, indicated by:
2. Slowly heat the sugar by placing the spoon over the flame.	-A strong odor similar to (the smell of caramel) appears	-The appearance of a strong odor (the smell of caramel) - The color changes -The smoke rises -The formation of a new substance (<u>carbon</u>)

	Properties of substances before the reaction	Properties of substances after the reaction
Color	-White - solid 	Black substance 
Odor	-Odorless	-Strong odor and smoke

ACTIVITY (2) : THE REACTION OF OIL WITH CAUSTIC SODA

Tools: Oil - Glass beaker - Caustic soda solution (sodium hydroxide) - Flame - Stirring rod

Steps	Observation	Conclusion
1-Place 100 ml of vegetable oil in a glass beaker with a capacity of 250 ml. 2-Add 30 ml of caustic soda solution (sodium hydroxide) to the oil drop by drop. 3-Heat the mixture using a suitable heat source of 40-50 C while stirring the ingredients well together in one direction. 4-Observe the changes that occur and record them.	- The consistency of the mixture change. - A new substance is Formed 	Adding oil to the caustic soda solution while heating leads to a chemical reaction, indicated by a change in consistency and a new substance (soap) is formed. 

The texture of the substance changes before and after the reaction, as shown in the following table.

	<u>Properties of substances before the</u>	<u>Properties of substances</u>
	<u>..</u>	<u>after the reaction</u>
State	Oil: Liquid Concentrated sodium hydroxide solution	Soap: Solid

WORKSHEET (1)



Give reason :

1-Melting ice is considered a physical change.

.....

.....

2-Burning wood is considered a chemical change.

.....

.....

3- Adding drops of food coloring to a glass of water not considered a chemical reaction, even though the water changes color

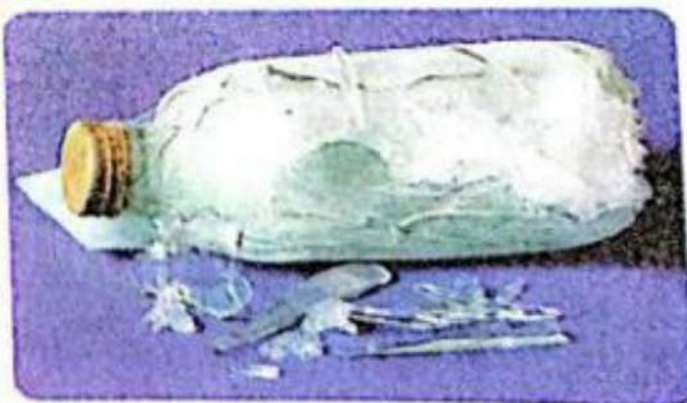
.....

.....

➤ Do the following changes indicate a chemical reaction? Why?

.....

.....



Lesson (2): Chemical Equations

❖ Most elements in the periodic table exist under normal conditions as **mono-atomic molecules**

℞ **Diatomic molecules** only 7 elements, which are:

Diatomic Elements

Hydrogen $\longrightarrow$ H_2
Nitrogen $\longrightarrow$ N_2
Fluorine $\longrightarrow$ F_2
Oxygen $\longrightarrow$ O_2
Iodine $\longrightarrow$ I_2
Chlorine $\longrightarrow$ Cl_2
Bromine $\longrightarrow$ Br_2



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Ions of Elements and Atomic Groups

Some Metals, Positive ions (cations)

Lithium	Li^+
Sodium	Na^+
Potassium	K^+
Silver	Ag^+

Some Non-Metals, and their negative ions (anions), atomic groups

Fluoride	F^-
Chloride	Cl^-
Bromide	Br^-
Iodide	I^-

Magnesium

Mg^{+2}

Hydroxide

OH^-

Calcium

Ca^{+2}

Nitrate

NO_3^-

Zinc

Zn^{+2}

Nitrite

NO_2^-

Barium

Ba^{+2}

Bicarbonate

HCO_3^-

Aluminum

Al^{+3}

Carbonate

CO_3^{-2}

Ammonium

NH_4^+

Sulfate

SO_4^{-2}

Sulfite

SO_3^{-2}

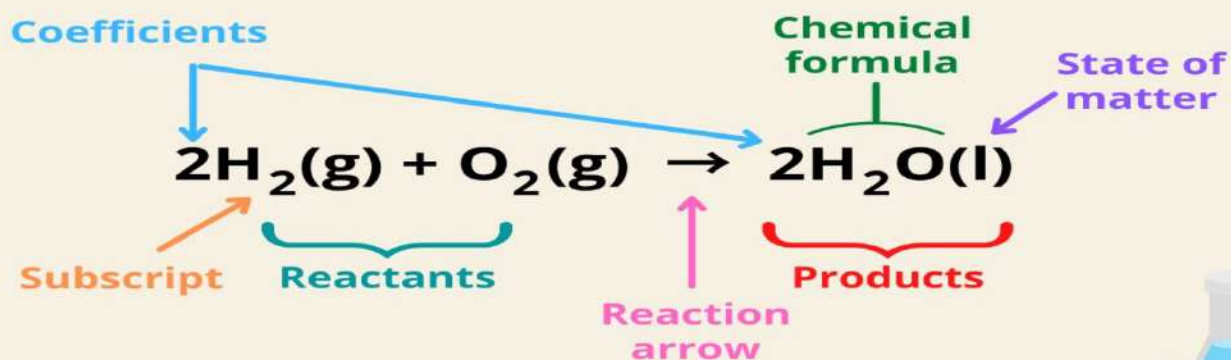
Phosphate

PO_4^{-3}

The Chemical Equation

What Is a Chemical Equation?

A chemical equation is a written representation of a chemical reaction.



List reactants on the left side of the reaction arrow and products on the right side.



Separate each reactant with a plus sign (+), Writing the physical state of each symbol or formula below it as it appears during the reaction.



- The symbols and formulas of **the reactants** are written on the **left side** of the equation.
- The symbols and formulas of **the products** are written on the **right side**, below each of them is a subscript symbol that expresses the physical state.
- The **reactants and products** are linked by an arrow that indicates the direction of the reaction and the reaction conditions such as **catalysts that increase the speed of the reaction without being consumed or changed**.
- All metals are solid except **mercury** (the only liquid metal).
- Reaction conditions written **above the reaction** arrow.

Physical State	Symbol
Solid	S
Liquid	L
Gaseous	G
Vapor	V
Aqueous solution	aq

Meaning	Symbol
Heat	Δ
Catalyst	Cat
Dilute Solution	Dil.
Concentrated Solution	Conc.

Write a symbolic equation for the reaction of **sodium bicarbonate** with **dilute hydrochloric acid**, forming **sodium chloride solution**, **water**, and **carbon dioxide** gas.



Formula

-NaHCO₃ (s)
 -HCl (aq)
 -NaCl (aq)
 -H₂O (l)
 -CO₂(g)

Physical State

-Solid
 -Aqueous solution
 -Aqueous solution
 -Liquid
 -Gas

Description

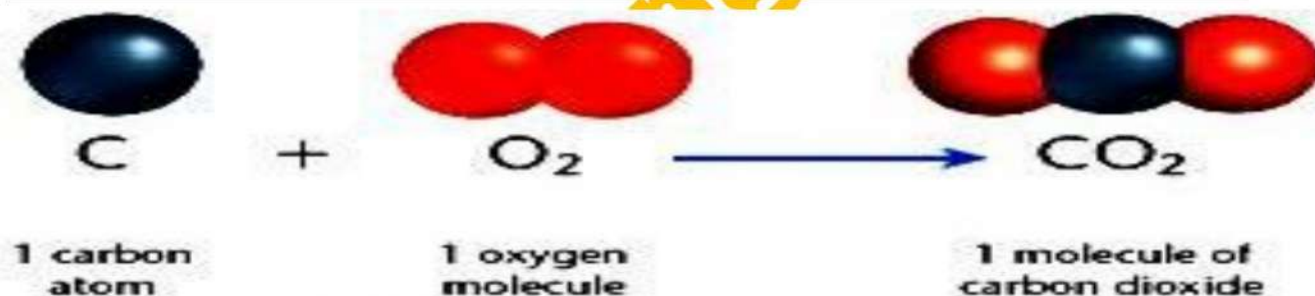
Sodium bicarbonate salt.
 Diluted hydrochloric acid.
 Sodium chloride solution.
 Water.
 Carbon dioxide gas

**Law of Conservation of Matter**

Matter is neither created nor destroyed, but it transforms from one form to another.

Chemical Reaction:

Reactants	Products
C _(s) – 1 carbon atom	CO _{2(g)} – 1 carbon atom, 2 oxygen atoms
O _{2(g)} – 2 oxygen atoms	



Explanation: In a chemical reaction, the internal elements remain the same. Atoms are not created or destroyed; they are simply rearranged to form new substances.

Note: A symbolic chemical equation is considered balanced when the number of atoms of each element in the reactants is equal to the number of atoms of the same element in the products.

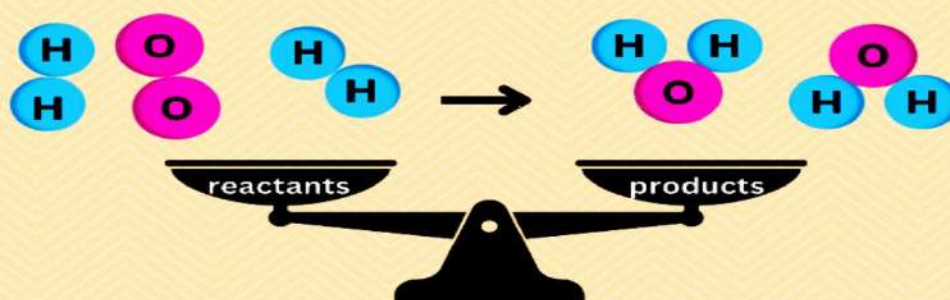


Law of Conservation of Mass

The total mass of the substances involved in a chemical reaction is equal to the total mass of the substances produced by the reaction.

Law of Conservation of Mass

Matter is neither created nor destroying by chemical reactions or physical changes.



- The mass of the system is the same before and after the reaction.
- The number and type of atoms does not change.

Antoine Lavoisier

A French chemist, philosopher, economist, and biologist.

He was the first to formulate the Law of conservation of mass, and the first to prove that oxygen is an essential substance in combustion, and he was the one who named it.

He developed the modern system for naming chemical substances.

He is known as the Father of Chemistry for his emphasis on precise experimentation.



The sum of the masses of the substances before the reaction equals the sum of the masses of the substances after the reaction.



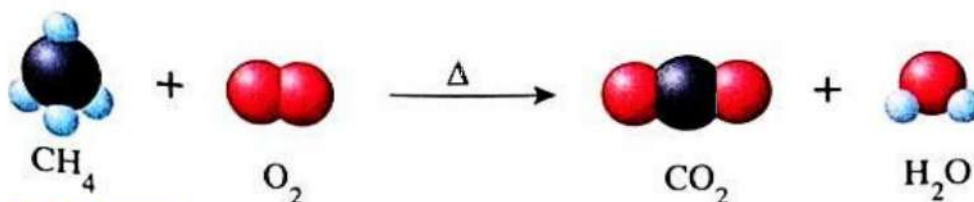
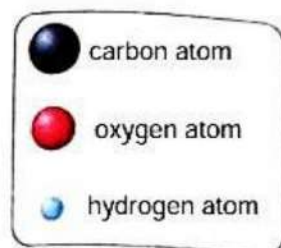
Observation

The sum of the masses of the substances before the reaction (CaCl_2 , Na_2SO_4) equals the sum of the masses of the substances after the reaction (NaCl , CaSO_4).

Conclusion:

The mass of the reactants does not change despite the occurrence of a chemical reaction accompanied by the formation of a precipitate of calcium sulphate. This indicates that chemical reactions obey the law of conservation of mass.

Diagram represents the combustion reaction of methane gas (CH_4) in oxygen gas (O_2), to form carbon dioxide gas (CO_2) and water vapor (H_2O).

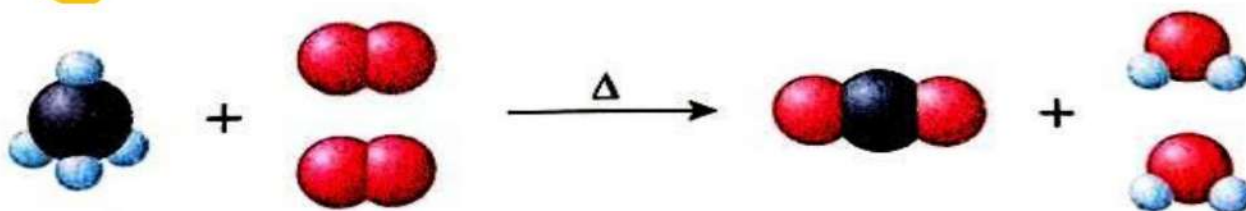


It is evident that the equation: $\text{CH}_4 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$

Doesn't satisfy the Law of Conservation of Matter?

Doesn't satisfy the Law of Conservation of Matter of mass?

Because the mass of the reactants does not equal the mass of the products. By repeating the previous reaction after adding one molecule of oxygen (O_2) to the reactants and one molecule of water (H_2O) to the products.





The diagram represents an equation achieving the Law of Conservation of Matter

Because the number of atoms of each element in the reactants is equal to the number of atoms of the same element in the products.

- The numbers in blue are called coefficient.
- The numbers in green are called subscripts.
- This equation is a balanced symbolic equation.

Balanced Symbolic Equation

A symbolic chemical equation in which the number of atoms of each element in the reactants is equal to the number of atoms of the same element in the products.

Subscript

The numbers written below the symbols of the elements in a molecule, representing the number of atoms of each element in one molecule.

Coefficients:

The numbers placed before the symbols of elements or molecular formulas of compounds in a balanced symbolic equation.

Coefficients represent the simplest ratio in which reactants combine to form products.

The number 1 is not written for coefficients or subscripts.

In the following reaction:



- How many atoms of each element are present in the reactants and products of this reaction?



- What is the total atomic count of the atoms forming the reactants and the products?
- What is the total number of molecular coefficients for the reactants and products?

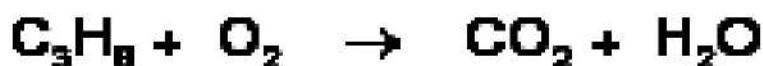


reactants		
Fe	O	C
$1 \times 2 = 2$	$3 + 3 = 6$	$3 \times 1 = 3$

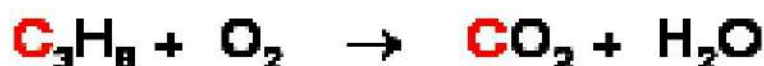
products		
Fe	O	C
$2 \times 1 = 2$	$3 \times 2 = 6$	$3 \times 1 = 3$

Balancing chemical equations

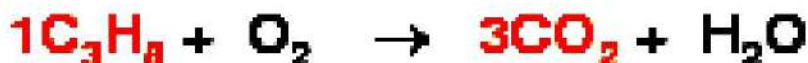
Step 1: Write reactants and products



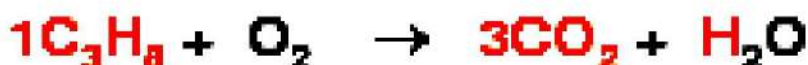
Step 2: Find one atom that occurs only in one substance on both sides



Step 3: Find coefficients to balance this atom



Step 4: Find another unbalanced atom which occurs in only one substance



WORKSHEET (2)



Write the chemical equations expressing the following reactions, including the physical states of the reactants and products:

1-The burning of carbon in oxygen gas to form carbon dioxide.

.....
.....

2-The reaction of sodium with dilute hydrochloric acid to produce a solution of sodium chloride and water, with gas bubbles.

.....
.....

3-The reaction of silver nitrate solution with sodium chloride solution to form a white precipitate of silver chloride.

.....
.....

4-The reaction of zinc with copper sulfate solution to form a colorless solution and a brown precipitate.

.....
.....

5-The reaction of magnesium with dilute hydrochloric acid to produce a solution of magnesium chloride and hydrogen gas, with gas bubbles.

Give reason for:

1-A chemical equation must be balanced.

.....
.....

2-It is preferable to express a chemical reaction with a balanced symbolic equation rather than with a word equation.

.....
.....

3-The mass of the reactants must be equal to the mass of the products of the reaction.

.....
.....



Lesson (3): Nutritional Chemistry

Nutritional chemistry: is a branch of chemistry that studies the types of nutrients in food, **including:**

1- Carbohydrates.

2- Fats.

3- Proteins

***First: Carbohydrates:**

Carbohydrates: are organic compounds that contain carbon, hydrogen and oxygen.

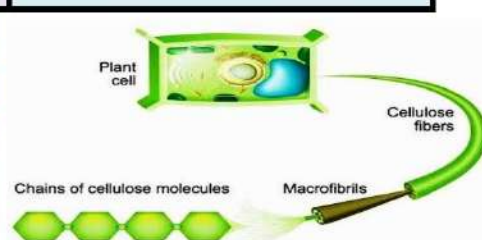
-They are the reason for the sweet taste of food.

-Sources of carbohydrates are

Bread, potatoes, rice, grains, vegetables, and some fruits such as grapes and apples.

-Carbohydrates divided into:

Monosaccharides	Oligosaccharides (Disaccharides)	Polysaccharides
The simplest form of carbohydrates, they cannot be hydrolyzed into simpler units by water.	They consist of 2 to 10 monosaccharides units.	They consist of more than 10 monosaccharides units.
Examples: - Glucose (grape sugar) - Fructose (fruit sugar)	Examples: - Sucrose (cane sugar) - Maltose (malt sugar)	Examples: - Starch - Cellulose



-Disaccharides: They are **oligosaccharides**, each molecule of which consists of two **monosaccharide units** with a molecule of water removed.

Examples:-

-Sucrose (cane sugar) is composed of one glucose unit and one fructose unit.

-Maltose (malt sugar) is composed of two glucose units.

-Testing for Glucose:

Tools: glucose solutions of different concentrations, test tubes, Benedict's solution, hot water bath.

Steps:

- 1- Place 2 ml of glucose solutions of different concentrations into separate test tubes.
- 2- Add 2 ml of Benedict's solution to each test tube.
- 3- Heat the test tubes in a water bath for 5 minutes.

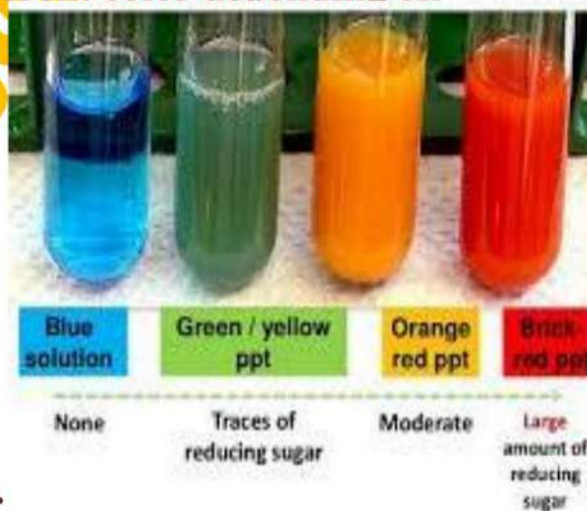
Observation: Each test tube shows a different color depending on the glucose concentration.

Conclusion:

- 1- **Red color** indicates a high concentration of glucose.
- 2- **Orange color** indicates a medium concentration of glucose.
- 3- **Green color** indicates a low concentration of glucose.
- 4- **Blue color** indicates the absence of glucose.

-Diabetes: the accumulation of glucose in the blood because of a deficiency in the secretion of the hormone insulin which is produced by the pancreas.

-Symptoms include significant weight loss, increased urination, and excessive thirst.



Testing for starch

Tools: potato, iodine solution, dropper.

Steps:

- 1- Cut the potato into halves.
- 2- Put a few drops of yellowish-brown iodine solution on the inner surface of the potato.



Observation: The yellowish-brown iodine solution turns dark blue.

Conclusion: Potato contains starch, which changes the yellowish-brown iodine solution to dark blue.

-The importance of carbohydrates:

- 1- They support the brain functions.
- 2- They form a source of energy for the body.
- 3- Plant cell walls are made of cellulose.
- 4- They participate in forming the nectar of flowers.



The benefits of carbohydrates in many industries, such as:

- 1- Paper from cellulose.
- 2- Some cosmetics from sugars and starch.
- 3- Medicine capsules.



Nutritional Awareness

- It is recommended to reduce carbohydrates found in white sugar and white flour in the meals and to rely on whole grains.



***Secondly: Fats:**

Fats are composed of the same elements as carbohydrates.

-Sources of Fats:

- Butter
- Eggs
- Milk
- Meat
- Different kinds of nuts and plant oils.

-The Importance of lipids:

Fat provides twice as much energy as carbohydrates.

Nutritional Awareness

Foods High in Fat



Cholesterol: is a fatty substance found with body fats, and its deposition on the inside walls of the arteries leads to their blockage and increases the risk of heart diseases

- Maintaining normal cholesterol levels in the blood requires the following:

- 1- Reduce foods rich in fats.
- 2- Exercise regularly.
- 3- Drink plenty of water.

Cholesterol



Note: Both carbohydrates and lipids are the main chemical substances for transporting and storing energy in living tissues.

Detection of fats:

-Tools: Egg yolk – Sudan 4 solution – distilled water – test tubes

-Steps:

- 1- Place a portion of egg yolk (rich in fat) in a test tube
- 2-Add 10 ml of distilled water.
- 3-Add 10 drops of Sudan 4 solution.
- 4- Shake the mixture well.

-Observation:

The Sudan 4 solution stains fat droplets with an orange-red color on the surface of the mixture, showing that it contains fats.

- Conclusion:

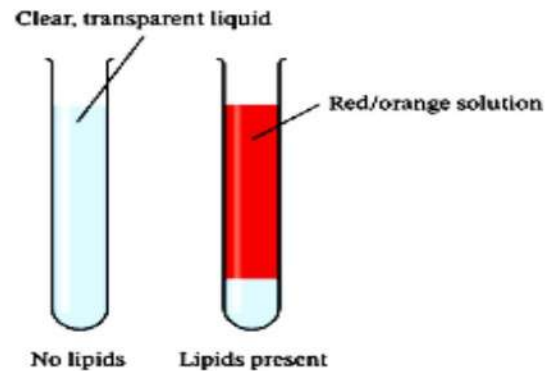
Sudan (4) solution gives a red-orange colour on the surfaces of the mixtures containing fat.

*Thirdly: Proteins:

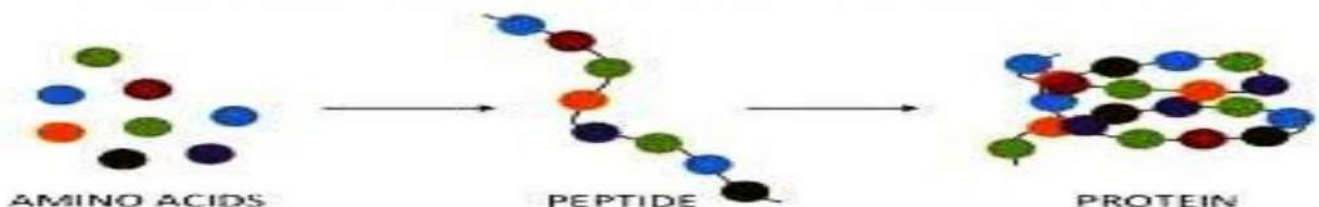
-Proteins are composed of the same elements as carbohydrates in addition to nitrogen and, in most cases, phosphorus..

-Proteins are made up of simple units called amino acids.

Proteins: are organic chemical compounds made of simple units called amino acids, linked together in various ways.



Amino acids and Proteins



Sources of proteins

Animal Protein Sources:

- Red meat
- Poultry
- Fish
- Eggs
- Milk and its derivatives.

Plant Protein Sources:

- Legumes
- Nuts
- Soybeans

Importance of proteins

- 1-They contribute in building **muscles**, **skin**, **hair** and **nails**.
- 2- They repair the **damaged** cells and tissues.
- 3- They are used in the formation of **enzymes** that act as catalysts.
- 4- They are used in the formation of **antibodies** that support the immune system against disease-causing microbes.

The importance of proteins in industry:

- 1-**Enzymes** are used in the manufacture of **biological detergents** to remove stains.
- 2-The production of **insulin** used in the treatment of diabetes through genetic engineering
- 3-The extraction of **gelatin**, used in the food industry from proteins found in the bones and skins of animals.

Note: Some athletes use nutritional supplements containing amino acids to increase muscle mass. However, excessive use of these supplements may cause serious health risks.

Detection of proteins:

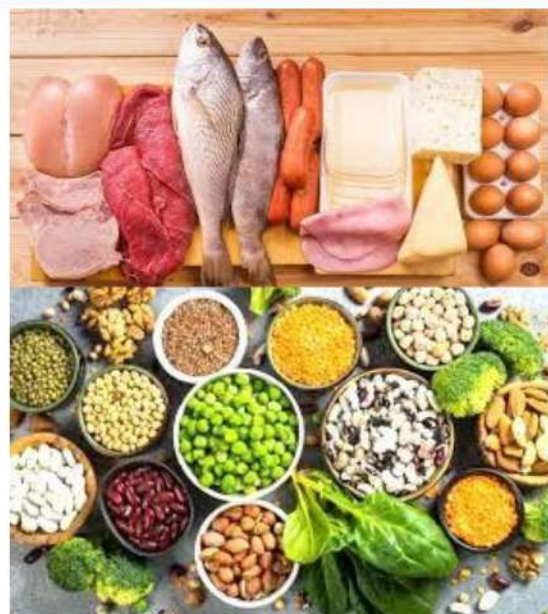
-Tools: White eggs – Biuret solution – test tubes

-Steps:

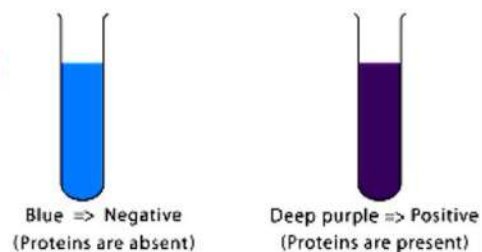
- 1- Put a portion white egg white into a test tube.
- 2-Add a few drops of Biuret solution.
- 3- Shake the mixture well.

-Observation: The Biuret solution changes from **blue** to **violet** when added to proteins.

-Conclusion: Biuret solution changes from blue to violet when added to proteins.



Biuret Test Result



WORKSHEET (3)

1-What happens if.....?

The combination of two glucose units together.

.....
.....

2- What is the importance of proteins in industry?

.....
.....

3-Give a reason for....

Carbohydrates have great importance in industry.

.....
.....
.....
.....

4-Give examples for:

1- Oligosaccharides.

.....
.....

2-Plant Protein Sources

.....
.....



UNIT (3)

Lesson (1): Photosynthesis process

Van Helmont's experiment

Steps:-

- 1-He took a willow sapling weighing **2.2 kg** and planted it in a pot with **90 kg** dry soil.
- 2- He watered the tree for **5 years** without adding anything else.
- 3- After 5 years, he weighed the tree and the soil again, **the tree weighed 75 kg. The soil lost only 55 g.**

Conclusion:-

- 1-The increase in the tree's mass did not mainly come from the soil.
- 2- Soil contributes only a very small part.
- 3-Water is the key factor in plant growth.

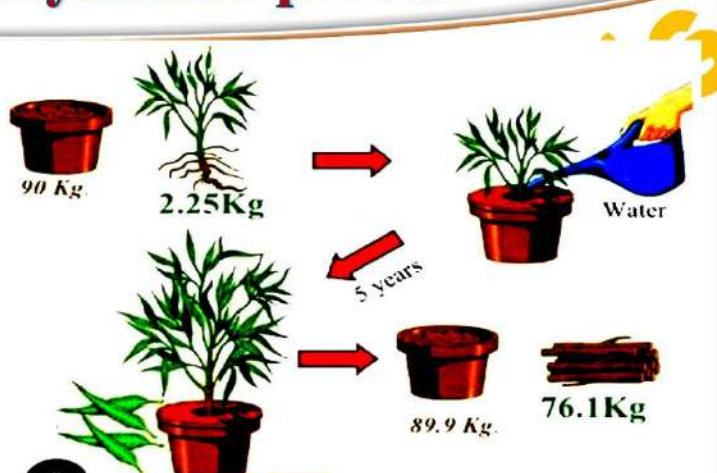
Researches showed that plants use carbon dioxide and sunlight to make their food by photosynthesis.

Photosynthesis that takes place in (**green plastids**) in the green parts of plants like:-

- 1- Leaves
 - 2- the herbaceous stems
- such as in Mallow (Molokhia) plant

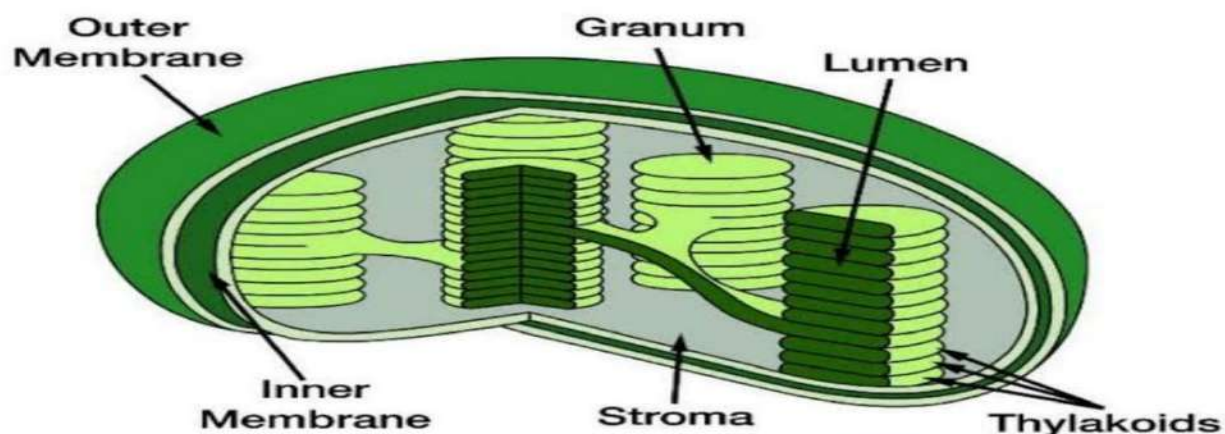
Note ► Water and mineral salts are transported from the roots to the rest of the plant through **the xylem tissue.**

► Food is transported from the leaves to the rest of the Plant through **the phloem tissue.**



Green plastids (chloroplast) structure:-

Chloroplast



Part	Description	Function
1- Double membrane (outer + inner)	Two layers surrounding the plastid.	Controls movement of substances in and out.
2- Stroma (fluid- filled space)	Inner space of the plastid,	contains enzymes needed for the reactions that do not require light, called light independent .
3- Grana (plural of granum)	Stacks of thylakoids (15 or more per stack) The edge in some thylakoids connects with another thylakoid Increases the surface area of the thylakoid membrane.	The light dependent reactions take place in the grana.

The thylakoid membranes contain several types of pigments, including green chlorophyll.



Classification of plastids according to pigments that they contain:-

1- Green plastids (chloroplast)

-Found in:
Mallow (Molokhia) plant.

2- Colored plastids (chromoplasts)

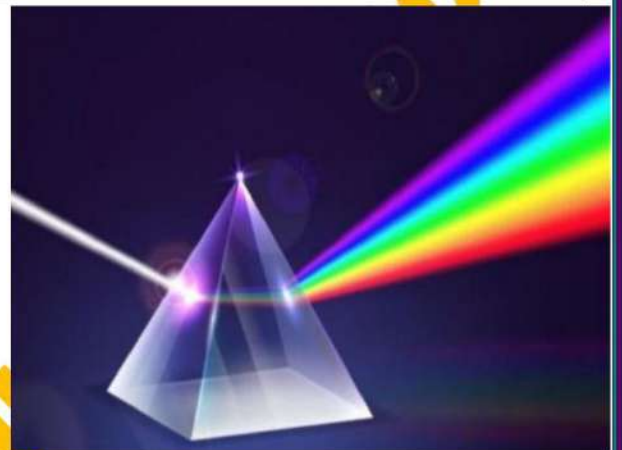
-Found in fruits as:
plums.
- In flower petals.

3- Colorless plastids (leucoplasts)

-Found in:
- Potatoes
- Sweet potatoes

Absorption of light by chlorophyll:-

When a white light fall on faces of glass prism it splits into the **seven colors** of the visible spectrum.



Activity:

Steps:

1. Cut some spinach leaves and place them in the mortar.
2. Add enough ethyl alcohol to cover the leaves.
3. Crush the leaves using the pestle until a green mixture is formed.
4. Use filter paper to separate the clear green solution in a test tube.
5. Place a red transparent sheet between the light bulb and the test tube containing the green solution.
6. Repeat step (5) using a blue transparent sheet and then a green transparent sheet.



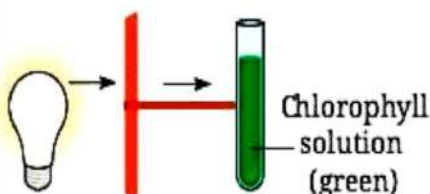
Spinach Leaves



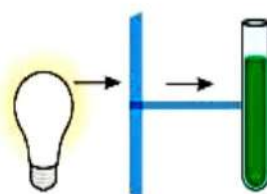
Pulverized Leaves



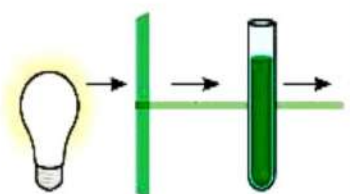
Green Solution



Red transparent sheet



Blue transparent sheet



Green transparent sheet

Observations:-

Red sheet: red light does not pass through (absorbed).

Blue sheet: blue light does not pass through (absorbed).

Green sheet: green light passes through (transmitted).

Conclusion:-

Chlorophyll solution transmits only green light but absorbs red and blue light, and uses their energy in photosynthesis.

The mechanism of photosynthesis:-

- 1- Light dependent reactions
- 2- Light independent reactions

First the Light dependent reactions:-

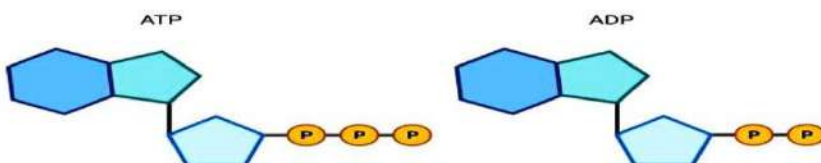
A group of chemical reactions that depend on the presence of light, (known as **Light dependent reactions**) occur on the **thylakoid membranes** as follows:

1- Chlorophyll absorbs blue and red light energies from the visible light, becoming active (excited) chlorophyll.

2- Part of the energy of the active chlorophyll is used to decompose Water into **oxygen and hydrogen**

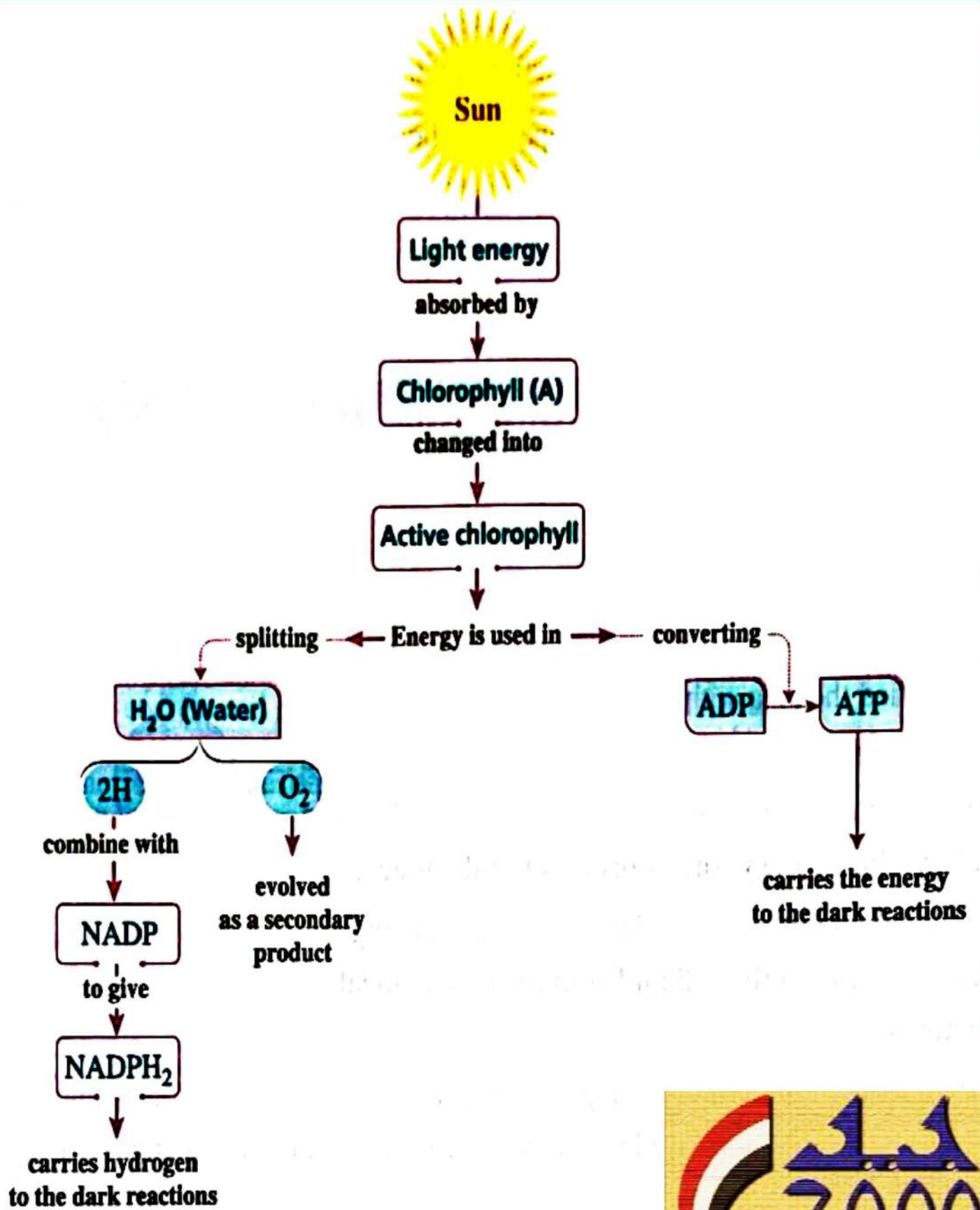
The oxygen is transferred to the air

3- The remaining part of the active chlorophyll energy is used to convert compound called Adenosine diphosphate **ADP** into the molecule of Adenosine triphosphate **ATP**



Note:-

When an electron in an atom gains a quantum of energy, it moves from its energy level to a higher energy level and the atom becomes unstable, and is called **excited atom**, hence the electron quickly loses the energy it gained and returns to its original energy level, and the atom becomes stable once again.

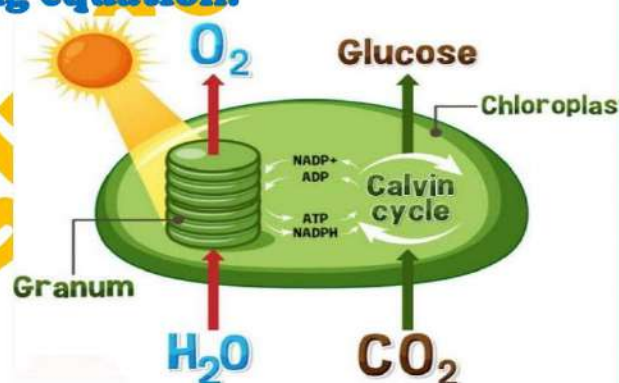
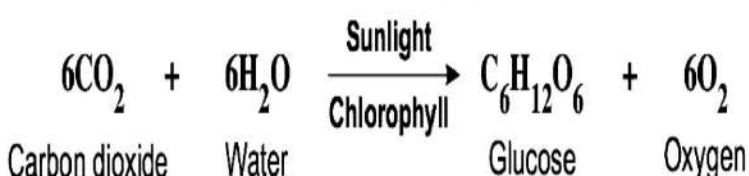


Second: the Light independent reactions:-

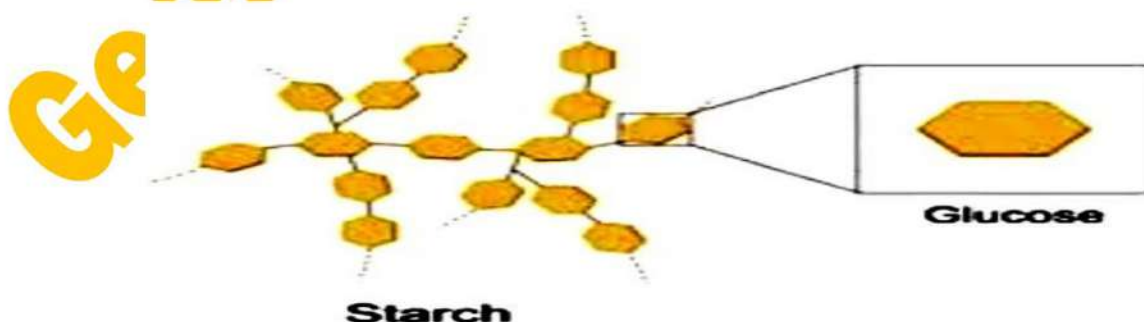
A group of chemical reactions that don't depend on the presence of light, (known as **Light independent reactions**) occur in the **stroma** as follows:

- 1- Hydrogen, carried on one of the chemical compounds which are present on the thylakoid membranes, is transferred to the stroma.
- 2- Hydrogen combines with carbon dioxide and the enzymes present in the stroma to produce **glucose** $C_6H_{12}O_6$

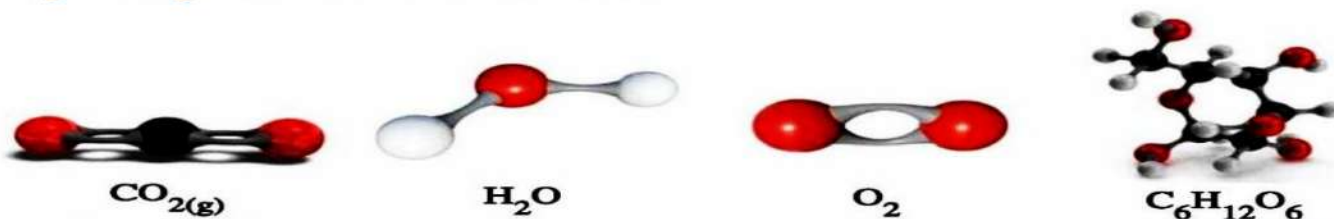
In the photosynthesis process, the plant rearranges the atoms obtained from simple molecules, which are water molecules absorbed from the soil and carbon dioxide molecules absorbed from the air, in the presence of sunlight to form its food (glucose), and release oxygen gas as a by-product, **according to the following equation:**



✱ The **glucose** produced from the **light** independent reactions of photosynthesis dissolves in **cold water**, it will **dissolve** in the **plant sap** and many of its molecules are linked together in **long chains**, forming **starch granules** that are sparingly soluble in cold water and are stored in the leaves, roots and stems. Storage efficiency is high in taro corms, sweet potato roots and potato stems.



Model of the reactants and products of photosynthesis by using ball and stick models:



Enzymes are protein molecules that work **as catalysts**; they increase the rate of light independent reactions without requiring the high temperatures used to carry out such reactions in research laboratories.

Activity: Starch formation in photosynthesis

Materials and tools:

Variegated leaf - Ethyl alcohol (ethanol) - tap water- iodine solution - Beakers -test tube - _heat source- dropper-Tweezers (tongs).

Steps:

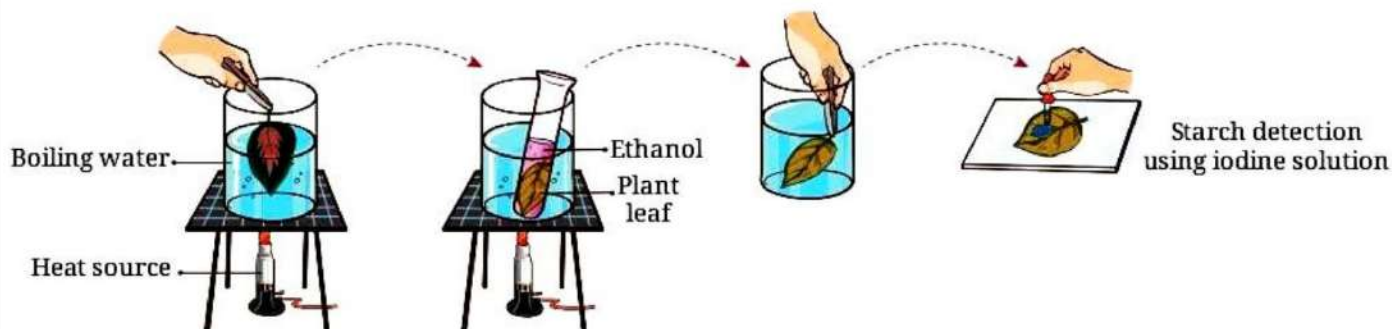
- 1- Take a variegated leaf from a plant that has been exposed to light for a sufficient period of time then place it in boiling water for two minutes **to break the cell walls**.
- 2- Transfer the leaf to a test tube containing ethanol and heat the tube in a hot water bath till the green chlorophyll color disappears, **so that its color does not interfere with the color that will be formed**.
- 3- Remove the leaf from the tube and wash it with water to make it soft once again.
- 4- Use the dropper to add drops of iodine solution to the leaf



Variegated leaves

Observation:

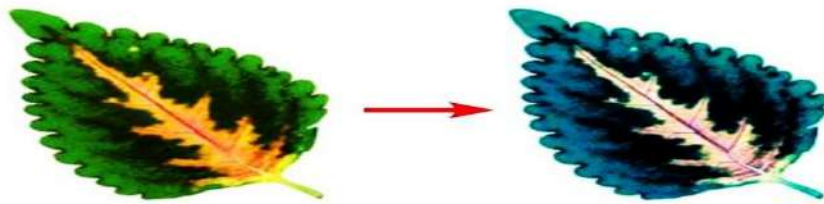
The part of the leaf colored with dark blue color.



5- the presence of **starch** in a plant leaf be **affected** if part of it is covered with an opaque tape that blocks the light before the start of the experiment (**The part that covered with an opaque tape can't make photosynthesis so it can't form starch**)

The importance of each of :

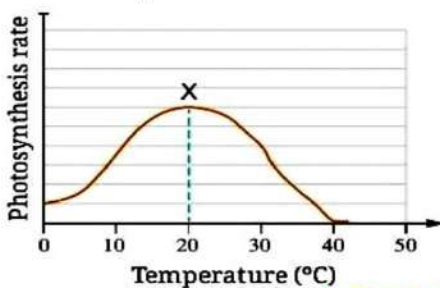
Chlorophyll in starch formation, as evidenced by the change in the color of iodine in the green areas only of the variegated leaf to dark blue



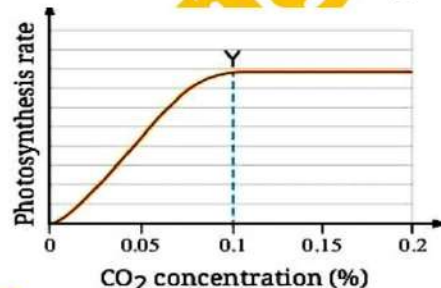
Light in starch formation, as evidenced by the fact that the colour of iodine does not change in the areas covered by the tape.

Factors that affect the rate of photosynthesis

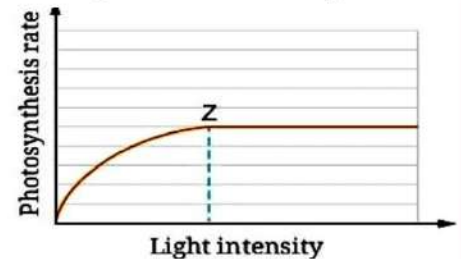
1-Temperature



2-Concentration of CO₂



3-Light intensity



The **optimal rate of photosynthesis** for each of the temperature, CO₂ concentration, and light intensity is **at points (X), (Y), and (Z)** in Figures.

6-Water **6- mineral salts** **7- wind**

are also factors that affect the rate of photosynthesis.

Vertical farming

Developed in modern cities that mimics the conditions which are suitable for farming to perform photosynthesis process.



The idea of work produce vegetables and fruits in multi-storey buildings (skyscrapers) using artificial lighting and hydroponics (water-based nutrients)

Importance provide a sustainable solution to the problem of lack of arable land (Agricultural land suitable for farming)

WORKSHEET (4)

Give reason for:-

1-The petals of flowers are colored.

.....

2-The chlorophyll solution appears green.

.....

3-Light reactions take place in the stroma.

.....

4-Glucose is stored in plants in the form of starch.

.....

What happens if:-

1- Blocking light from the grana.

.....

2-Water molecules absorb part of the energy of active chlorophyll.

.....

3-Covering part of a plant leaf exposed to sunlight with a black cover.

.....



Lesson (2): Cellular Respiration

Gas exchange occurs in the process of respiration, where living organisms obtain oxygen from the air and release carbon dioxide.

Respiration is the (gas exchange).

Cellular respiration is the process which provides us with energy:

Note: Plants do not have a specialized respiratory system, but they obtain oxygen necessary for respiration from the air through natural openings in the leaves called stomata.

First: Gas exchange

Gas exchange in plants is a biological process in which carbon dioxide gas and oxygen gas are exchanged with the surrounding environment to complete the photosynthesis process during the daytime and the respiration process during the day and the night.

Activity (1): (should be performed once in the presence of light and another time in the absence of light).

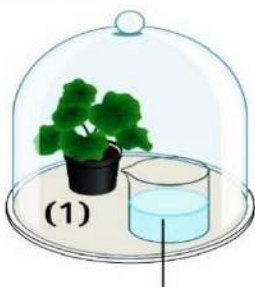
Materials and Tools Used:

- * 3 pots of plants of the same type.
- * 3 transparent glass bell jars.
- * A beaker containing clear limewater.
- * A beaker containing methylene blue solution.
- * Petri dish containing soda lime (mixture of sodium hydroxide and calcium oxide).

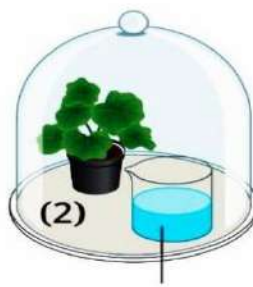
Note:

- The clear limewater solution turns milky when carbon dioxide gas is passed through it.
- The colour of the methylene blue solution disappears when oxygen is removed from the surrounding medium.
- Soda lime and sodium hydroxide solution are substances that absorb carbon dioxide gas from the surrounding medium.

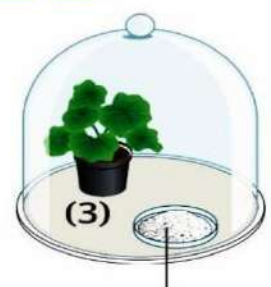
➤ Steps:



Clear limewater solution
Figure (1)



Methylene blue solution
Figure (2)



Soda lime
Figure (3)

- 1) Place the beaker of clear limewater next to pot (1) and cover them with the first bell jar (Figure 1).
- 2) Place the beaker of methylene blue solution next to pot (2) and cover them with the second bell jar (Figure 2).
- 3) Place the petri dish which contains soda lime next to pot (3) and cover them with the third bell jar (Figure 3).

Observation:

Figure (1):

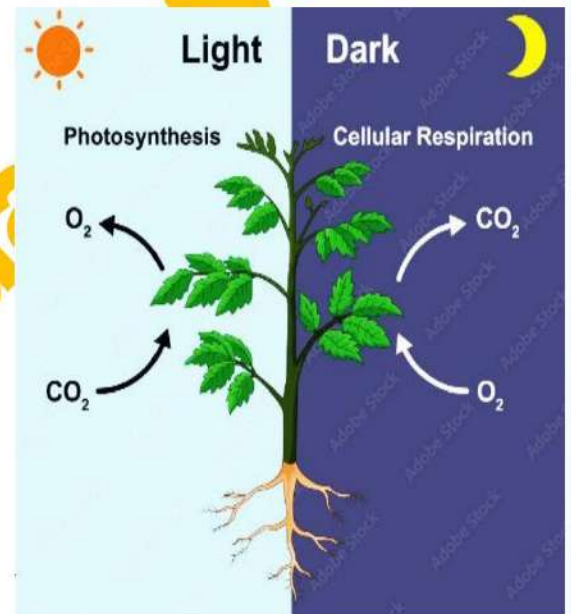
Daytime	Night-time
Lime water will not turbid.	Lime water will turbid.

Figure (2):

Daytime	Night-time
Methylene blue solution colour will not change.	Methylene blue solution colour will be removed.

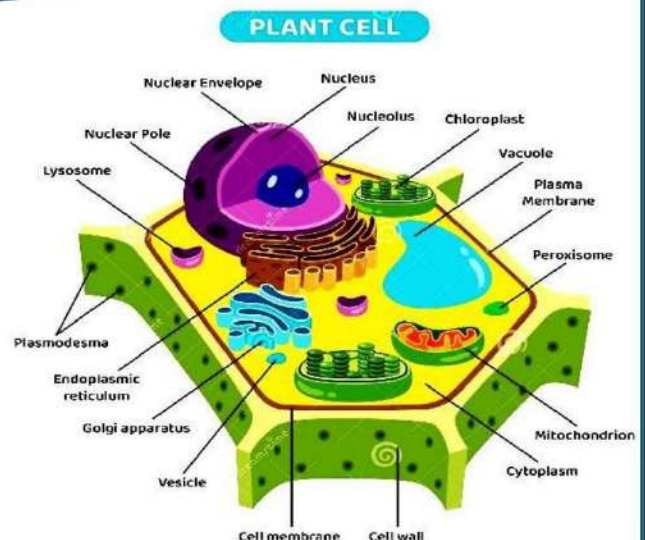
Conclusion:

1. Gas exchange will occur during respiration process by taking oxygen gas and expel carbon dioxide gas during daytime and night- time.
2. The colour of methylene blue disappears during night- time because of formation of oxygen gas during respiration process.
3. Lime water turns into milky (turbid) because of formation of carbon dioxide gas during respiration process at night- time.
4. Soda lime and sodium hydroxide solution are substances that could absorb large amount of carbon dioxide gas from the surrounding medium therefor the rate of occurrence of photosynthesis process decreases during daytime as shown in fig. (3).



Second: cellular respiration

The process of breaking down the large molecules of nutrients such as glucose inside the living cells in the presence of **oxygen**, where the atoms are rearranged to form smaller molecules of water and carbon dioxide gas, releasing



a quantity of energy in the form of **ATP** molecules. This process is known as **cellular respiration**, most of which takes place inside the **mitochondria**.

Mitochondria

Mitochondria (Singular: Mitochondrion) are specialized organelles that resemble beans and are found in most cells. They work as **power stations**, producing **energy** from nutrients.

Mitochondrion structure comprises:

1-Outer membrane to protect the components of the mitochondrion and regulate the entry and exit of substances.

2-Inner membrane forms folds called **cristae**, which **increase the internal surface area of the mitochondrion** and allowing more energy to be produced.

3-The matrix is a fluid found inside the inner membrane of the mitochondrion, containing the enzymes used to catalyze the reactions that take place inside the mitochondrion.

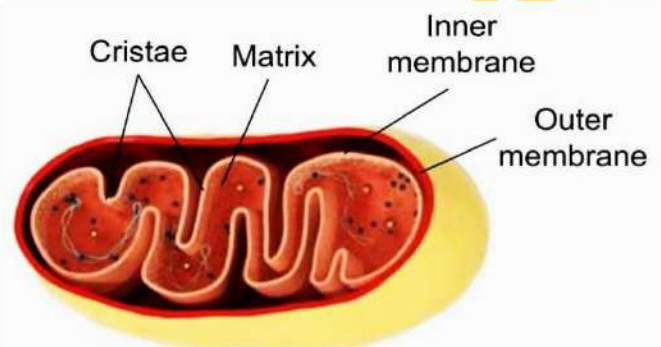


Figure (4)
Structure of a mitochondrion
(in eukaryotes)

The number of mitochondria increases in some cells, such as liver and muscle cells, which require a large amount of energy.

Note:

The inner membrane of the mitochondrion forms folds that increase its surface area, which enhances energy production in cellular respiration with high efficiency.



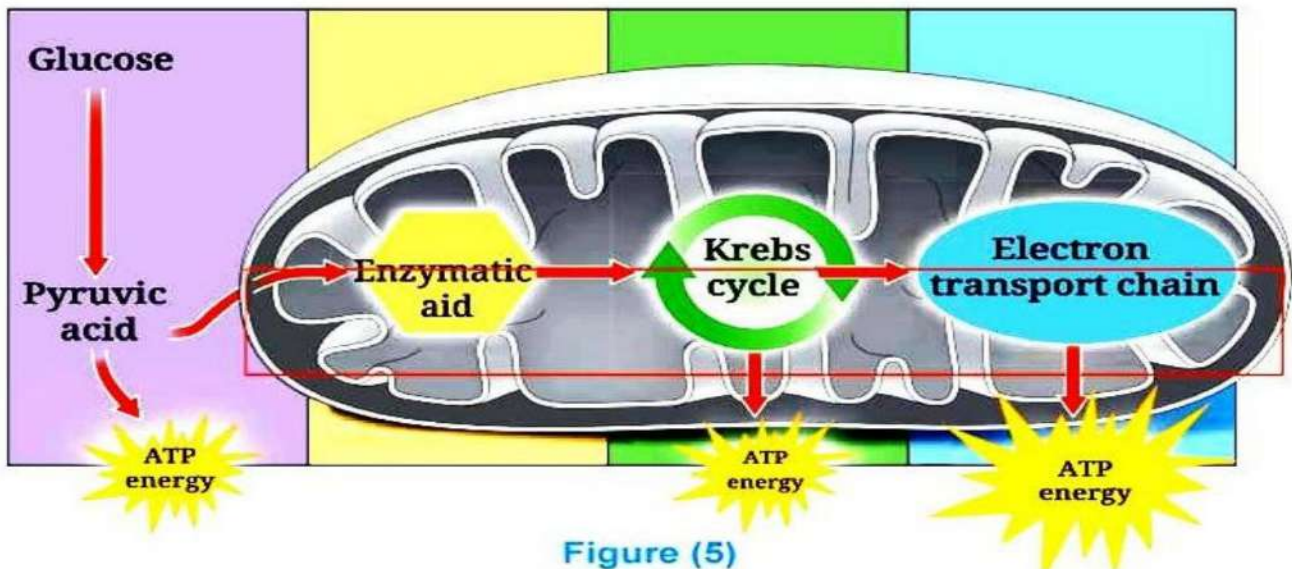


Figure (5)
Mechanism of cellular respiration

➤ Mechanism of Cellular Respiration Cellular respiration occurs in two stages:

1- The first stage: It takes place in the cytoplasm in the absence of oxygen of the atmospheric air, where all glucose molecules are broken down in the presence of water this process called **glycolysis** through a series of chemical reactions into two molecules of **pyruvic acid (pyruvate)**, in addition to the formation of limited energy in the form of **ATP molecules**. Pyruvic acid is transferred to the mitochondria.

2- The second stage: This takes place inside the mitochondria in the presence of **oxygen**, where two types of reactions occur:

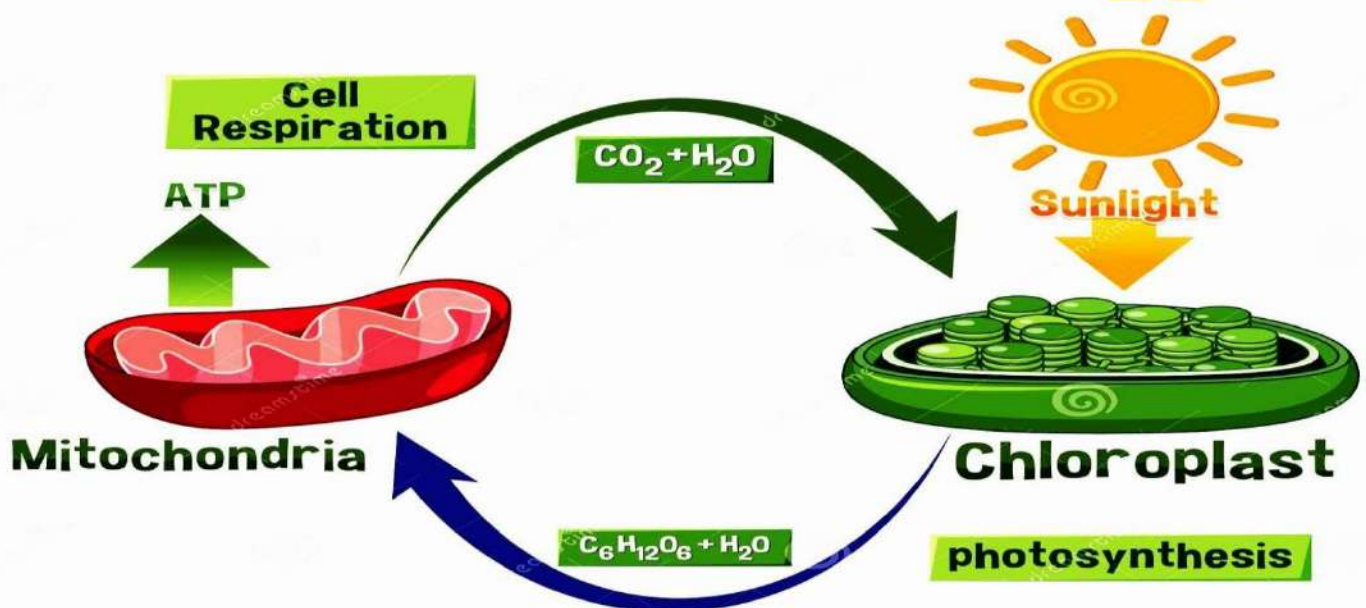
a-Krebs cycle reactions:

A group of chemical reactions that occur in the matrix, in which pyruvic acid is broken down, to produce limited energy in the form of ATP molecules and carbon dioxide gas, which is transferred to the atmospheric air.

b-Electron transport chain reactions:

It occurs in the inner membrane of the mitochondrion, involving the electrons which are produced from the Krebs cycle to form:

A large quantity of energy in the form of **ATP** molecules & **Water**.



➤ Energy and Metabolism:

Living organisms need energy to carry out all the vital processes necessary for survival, including growth and movement.

This is achieved through a series of chemical reactions that take place in the body's cells.

These reactions are called **metabolism** which includes

1-Anabolism (building up).

2-Catabolism (breaking down).

Anabolism (Building up processes):

Processes in which the energy of ATP molecules is consumed in building a large complex molecule from many simple molecules, such as the formation of glycogen from glucose and the formation of proteins from amino acids in the cytoplasm and ATP molecules from ADP molecules.



Figure (6)
Anabolic process

Catabolism (Breaking down processes):

Processes in which the energy of ATP molecules is released by breaking down a large molecule that has been built before into simpler molecules, such as breaking down of glucose molecules during cellular respiration and breaking down of protein molecules and glycogen molecules during digestion.



Figure (7)
Catabolic process

Technological Application:

Metabolic analyzer provides accurate data about the resting metabolic rate (during rest), helping in effective planning of diet and exercise for more successful and sustainable weight management.



WORKSHEET (5)

a) Give reasons for:

1- Most cellular respiration processes take place in the mitochondria.

.....

.....

2- The inner membrane in mitochondria has folds that increase the internal surface area of mitochondria.

.....

.....

b) Compare between each of the following:

1- Catabolism and anabolism.

.....

.....

2- Cellular respiration and photosynthesis process.

.....

.....

c) What will happen if...?

1- Oxygen gas percentage decrease in the cell.

.....

.....

2- Electron transport chain reactions stop in the mitochondria?

.....

.....

d) What is meant by:

1 - Mitochondria:

.....

2- Gas exchange in plant:

.....

UNIT (4)

Lesson (1): Changes in Earth's surface.

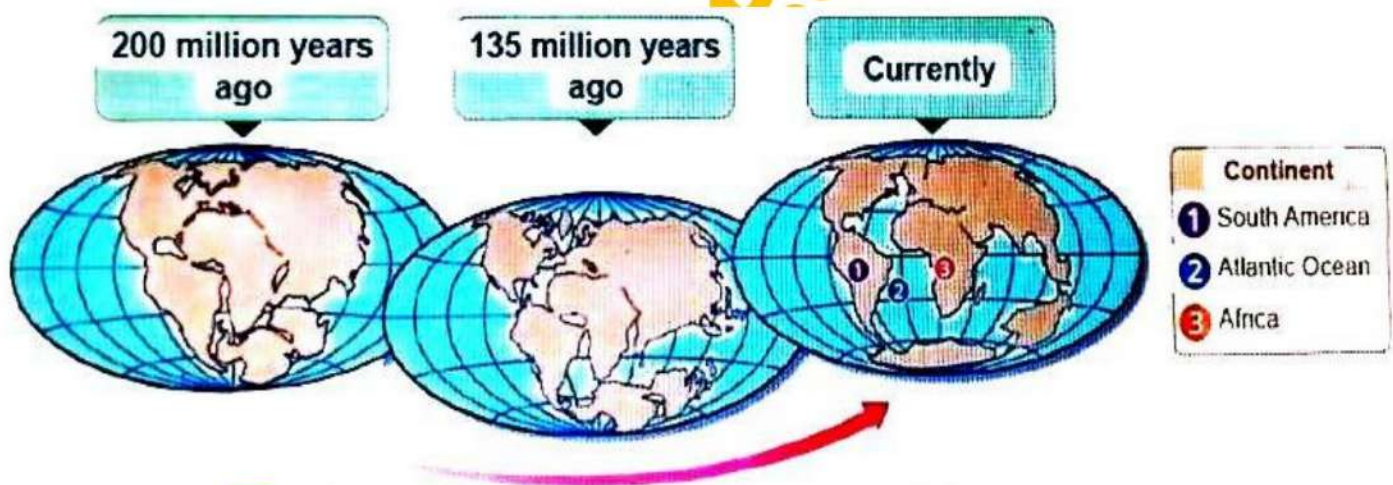
The continental drift hypothesis :

In 1912, German scientist Wegener.

200 million years ago: Wegener assumed that the land was a single large continent called **Pangaea**.

135 million years ago: apart of this continent began to drift over time (the continents of Africa and South America started to separate from each other).

Today: Over time the continents took on the shape they are today.



Wegener was unable to explain how the continents moved as they separated from each other, till the theory of tectonic plates emerged, which is considered the modern development of the continental drift theory.

The theory of tectonic plate:

1- The Earth's lithosphere

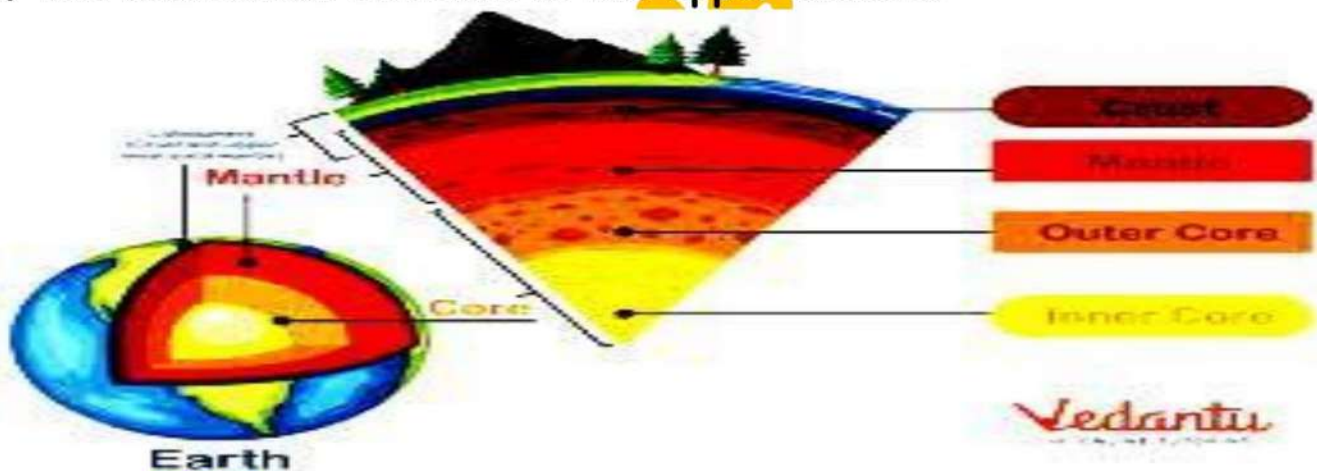
It includes earth crust and oceanic crust which consist from solid part

2- Tectonic plates:

They classified into oceanic continental plates.

- **Oceanic plates**, which are composed of a thin, high-density oceanic crust and a part of the upper mantle.
- **Continental plates** which are composed of a thick continental crust and a part of the upper mantle.

Tectonic plates move in a slow and continuous movement, barely noticeable in relation to each other, above a layer of molten rock (or magma) called the asthenosphere as a result of the movement of the convection currents in the upper mantle.



The movement of tectonic plates

The movement of tectonic plates affects the appearance of Earth's surface through the flow of magma beneath it.

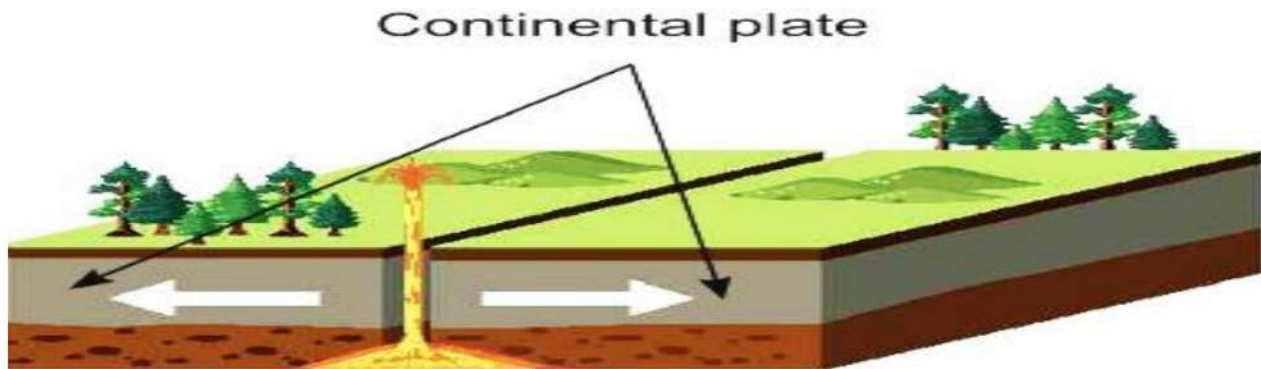
This movement is classified into three types

- 1-Divergent movement.
- 2-Convergent movement.
- 3-Transform movement.

1-Divergent movement.

It is the movement of tectonic plates away from each other.

Divergent boundaries: Is the area where the plates diverge.

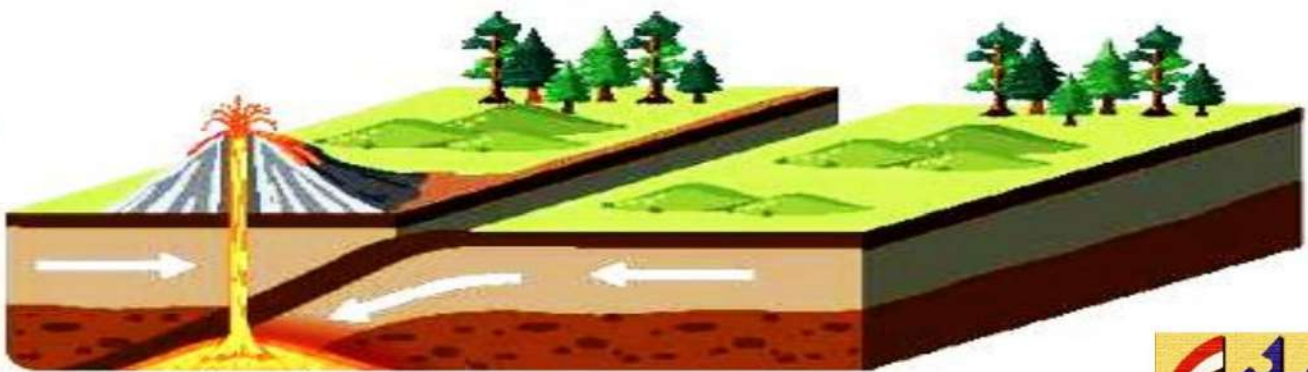


When two continental plates diverge due to the upwards convection current the following are established:

- A new oceanic crust such as the formation of the Red Sea in Africa.
- A new continental crust such as the formation of the African Great Rift valley.

2-Convergent movement:

The movement of tectonic plates towards each other, due to the downward convection current, where each two plates meet and one subducts (slides) under the other.



Convergent boundaries: The areas where the plates converge.

Convergence occurs between:

- Two oceanic plates,

Which resulted in the formation of new arcs (chains) of volcanic islands, such as the **Japanese islands**.

- Two continental plates-

Which resulted in the formation of the **Himalaya mountain range (Himalayas)**

- An oceanic plate with a continental plate:

The oceanic plate which is greater in density subducts under the continental plate, which has less density, this resulted in the formation of the **Andes mountain range**.



The Himalayas are higher than the Andes mountains.

Because of their higher peak.

The Andes mountains are longer than the Himalayas

Because of their geographical extension.

3-Transform movement:

The horizontal movement of tectonic plates that are parallel to each other (side by side).

Transform boundaries: the areas where the plates move



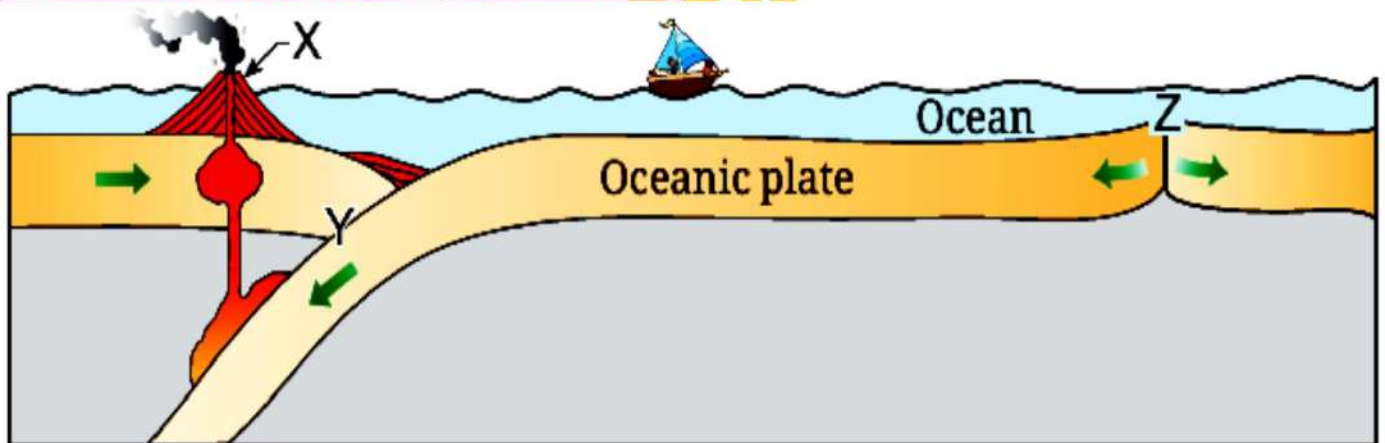
The transform movement resulted in the formation of long faults (fault lines) such as **San Andreas Fault**.



Geologists predict that new changes in Earth's land features will occur as the **tectonic plates continue** to move.

For example: The Red Sea will be converted into an ocean in the future, and the Mediterranean Sea will become a mountainous continental region.

Answer the following questions-



1- What is the feature of Earth's surface at point (X)?

It is volcano mountain.

2- What type of boundary is found at:

1. Area (Y) convergent boundaries.
2. Area (Z) divergent boundaries.



Comparison among the movements of tectonic plates

P.O.C	Divergent Movement	Convergent movement	Transform movement
Definition	The movement of tectonic plates away from each other	The movement of tectonic plates towards each other	The horizontal movement of tectonic plates that are parallel to each other
Examples	-The Red Sea in Africa -The African Great Rift Valley.	-The Japanese islands. -The Himalaya mountain -The Andes mountain	-San Andreas fault

The roles of earthquakes in change earth surface:

-Earthquakes are rapid, successive natural tremors that occur in Earth's crust.

-As the movement of tectonic plates leads to the storage of enormous amounts of energy in rocks. When the rocks break, this energy is released at the boundaries of the plates, forming **tectonic earthquakes**.

-The role of strong earthquakes in changing Earth's surface :

Earthquakes cause:

1- The emergence or submergence of some islands and coasts.

2- Landslides or landslips.

3- The Earth cracks.

4- The tsunamis, which change the shape of coastlines.



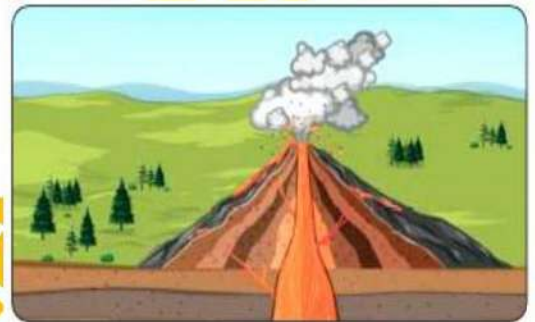
Earthquakes vary in intensity, as they may be weak and not felt by human, or they may be strong and lead to:

- **Human casualties**, including deaths and injuries.
- **Material losses** in the form of destruction of facilities and infrastructure, such as the collapse of buildings, roads, bridges, water, electricity and gas lines.

-The role of volcanoes in changing Earth's surface

- **A volcano** is a vent in Earth's crust that allows molten rock and trapped gases to escape to Earth's surface.

- **The theory of tectonic plates** forms the scientific basis for understanding the origin of volcanoes, as the **divergent movement of tectonic plates** creates a space between them into which **magma rushes**, and **convergent movement** leads to the melting of rocks, which rise to the surface through **cracks**, forming volcanoes at the boundaries of the plates



The role of volcanoes in changing Earth's surface is evident in

- 1- The formation of volcanic mountains such as the **Harrat Rahat**
- 2- Formation of flat plains and plateaus.
- 3- Covering (disappearance) of valleys and rivers.
- 4 -Change in the course of rivers.
- 5- Formation of volcanic islands such as the Hawaiian Island.



Damages caused by volcanoes include:

- **Human casualties** due to inhalation of toxic gases and volcanic ash.
- **Environmental losses**: such as cities being covered in volcanic ash, which may lead to their disappearance, air and water pollution and the formation of acid rains.

-The role of meteorites in changing Earth's surface:

-Meteorites are rock masses that penetrate Earth's atmosphere and fall to the ground.

Some of them cause huge circular craters, such as the Arizona crater in the United States and the Mount Kamel crater in the Western Desert in the New Valley Governorate in Egypt.

Scientists believe that meteorites caused the extinction of the dinosaurs long before human existence.



NASA has developed an advanced radar system known as **DART**,

Function of DART:

Is to change the orbit of meteorites to protect Earth from meteorite collisions.



WORKSHEET (6)

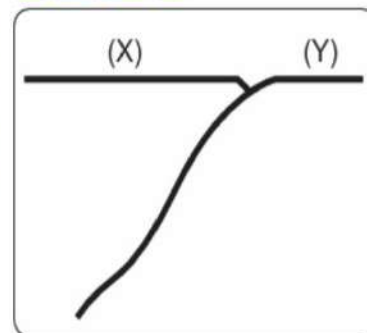


Define meteorites:

Mention the role of meteorites in changing in earth surface

The following figure shows a convergent boundary:

(1) Draw arrows on the figure to show the direction of movement of the two plates (X) and (Y).



(2) Classify the plates (X) and (Y) into continental plates and oceanic plates, with explanation.

Plate X:Continental

Plate Y:oceanic

Lesson (2): Formation of minerals and soil

Formation of minerals and soil:

Mineral is a naturally occurring solid inorganic substance that has a crystalline structure and a specific chemical composition.

<i>Minerals</i>	Exist in the form of elements	Exist in the form of compounds
<i>Example</i>	 Such as sulphur	 Hematite [red iron oxide]: is widespread in the eastern desert of Egypt.

Properties of minerals:

The specific chemical composition of mineral gives it specific crystalline structure, plays critical role in determining its properties:

- 1- Colour 2- Luster [shining] 3- Transparency

1- The colour:

Some minerals have definite colour.	Some minerals change colour depending on the type of impurities they contain.	
Such as sulphur 	Such as quartz  Pink quartz	 violet quartz

2-Luster [shining]



Some minerals have luster similar to that of metals
Such as **galena** was used by the **ancient Egyptians** to make eye **makeup (kohl)**.



3- Transparency

The minerals differ from each other in their ability to allow light to pass through them.

Opaque minerals	Translucent minerals	Transparent minerals
Such as talc  Can't pass light through it.	Such as mica  Pass some of light through it	Such as Pure quartz  Pass most of light through it.

Halite [table salt crystals]: is described as a mineral.

Opal: is described as mineraloid.

Because it has a specific chemical composition and luster and it is not crystalline unlike halite

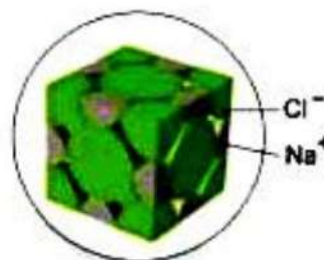


Figure (9)
Halite crystal



Figure (10)
Opal

Origin of minerals



Minerals originate in nature from:

1- Magma solidification.

2- Crystallization of solutions from hydrothermal vents.

1- The formation of minerals from magma solidification:

Most of the minerals that make up the crust of earth are formed by magma solidification.

When **Silica** rich **magma** solidifies, it forms minerals such as **mica and quartz**

When the **magma** contains relatively high amounts of **magnesium** and **iron** solidifies, it forms minerals such as **pyroxene and olivine**.



Pyroxene



olivine

3- The formation of minerals from the crystallization of solutions from hydrothermal vents.

The process of mineral formation from the crystallization of solutions can be explored **by performing the following activity:**

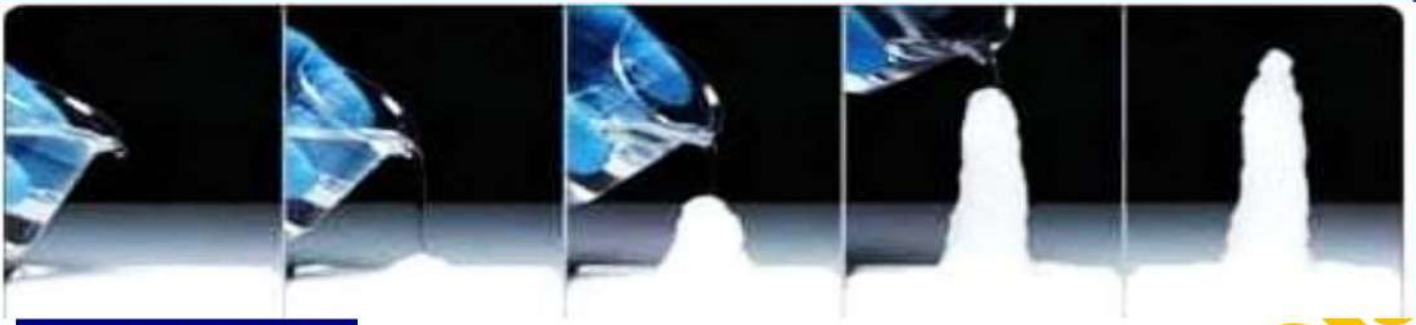
Activity (1)

Materials and tools

Sodium acetate salt - Water - Beaker - Heat source

Steps:

- 1- Dissolve sodium acetate salt in a beaker containing water to form a saturated solution that cannot accept more salt.
- 2- Heat the saturated solution and add more salt to form a super saturated solution.
- 3- Slowly pour the hot solution into a quantity of cold solid sodium acetate Salt.



The observation

-The excess salt in the super saturated solution collects around the cold salt in a process of **crystallization**.

Hydrothermal vents were formed near active **volcanic areas**, where **ocean water seeps into cracks** beneath the surface of earth

So water is heated by the **heat of the magma** and dissolves some of the minerals which compose the surrounding rock.

-The super- heated water [**400°C**] loaded with minerals rises once again to the surface through porous rocks.

-When it comes into contact with the **cold ocean water** [**2°C**] many minerals such as **apatite and calcite** become **crystallized**.



Note: The solution is a homogeneous mixture of a solvent and a solute. The most common and important solvent is water,

The soil:

Is the surface layer of crust of the earth resulting from the fragmentation of rocks and the decomposition of organic matter or both

Mature soil contains:

Water - Air -Humus [**decomposed organic matter**]- Clay- Silt- Gravel- Sand

Types of soil:

1-Transported soil

2- Sedentary soil

Types of soil depend on the way it was formed

Weathering: is the process of breaking and fragmenting the rocks, it can be mechanical .caused by wind , running water ,temperature differences , the growth of plant roots inside rock cracks or chemical.

Erosion: is the process of transporting rock fragments resulting from weathering process away from the areas where they were originally found

Transporting soil	Sedentary soil
Includes several types: River soil: is the soil that has been broken down in one place and then transported to another by rivers. Such as: The soil of the Nile delta. The Nile river transported rock fragments from the Ethiopian plateau to Egypt over millions of years. The chemical composition of this soil differs from the composition of the rock above it in its current location.	Includes several types: Residual soil: which is the soil that has formed as a result of slow weathering of the rocks at the same place and resembles the original rock above it in chemical composition. Such as: Mariout soil and oasis soil. were formed from the fragmentation of sandy and limestone rocks.

- *The most Egyptian soil is of the transported type.
- *Weathering of rocks cause the formation of soil.

Limited non-renewable resources:

Non-renewable resources:
 Are natural resources that can be obtained from the spheres of the earth [biosphere] and cannot be replenished once consumed
Examples . Minerals and fossil fuels.

In The late 18th century and the start of industrial revolution the consumption of non - renewable resources increased which causes a threat of depletion, especially since it takes millions of years to be replenished so we have to use a renewable resources

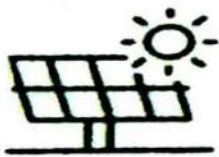
- . Minerals and fossil fuels are examples of non-renewable resources.
- . **Non-renewable resources are limited.**
 So, there is an urgent need to reduce the rate of its consumption.



- . Increased human activity in mining field, which is the extraction of the **natural resources**, such as **fossil fuels and minerals**, as well as the control of the non-renewable resources in developing countries by the major mining companies in the developed countries through the agreements, **leads to the unfair distribution of** natural wealth (resources) and possibly to its depletion.

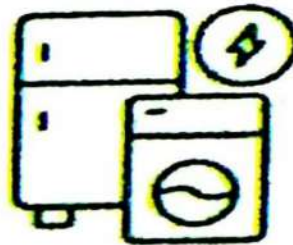
Ways of preserving the sustainability of the non-renewable natural resources by:

- 1- Shifting to the use of renewable sources such as **solar energy**, **wind energy** and **hydroelectric energy**.



- 2- Recycling minerals instead of new mining.

- 3- Using technologies that consume less energy, such as **electric cars** and **energy- efficient appliances**.



- 4- Developing industrial alternatives to resources, such as rechargeable batteries.



MODEL ANSWER

WORKSHEET (1)

Give a reason :

- 1-Due to the change in the state or shape of matter without altering its chemical composition.
- 2- Because, new substances with chemical properties is formed different from those of the original materials
- 3- Because the water simply takes on the color of the added substance, and no new substances are formed.

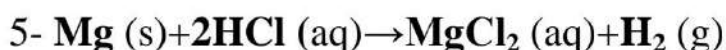
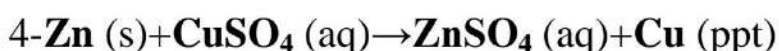
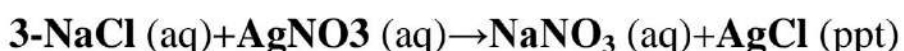
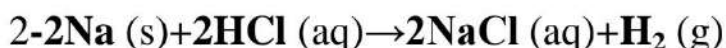
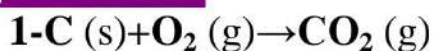
Do the following changes indicate a chemical reaction? Why?

- No, because the expansion of water during freezing does not change the chemical composition of the water or the glass.



WORKSHEET (2)

Write the chemical equations expressing the following reactions, including the physical states of the reactants and products:



Give Reason :

- 1- To achieve the law of conservation of mass and matter.
- 2- To simplify the equation and mention the states and the subscripts and coefficients of the substances in the reaction.
- 3- To achieve the law of conservation of mass.

WORKSHEET (3)

1-What happens if.....?

- Maltose is formed.

2-What is the importance of proteins?

- Proteins are used in the manufacture of antibiotics.
- The production of insulin used in the treatment of diabetes through genetic.

3-Give a reason for:

It is used in the manufacture of paper from cellulose and some cosmetics from sugars and starch.

4-Give examples for:

- 1-Sucrose – Maltose
- 2-Legumes and Nuts



WORKSHEET (4)

Give reason for :

- 1-Because they have colored plastids (chromoplast).
- 2-Because green light passes through while the other colors of the spectrum are absorbed
- 3-Because it contains most of the enzymes needed for the light in depended reactions.
- 4- Because the glucose produced from photosynthesis dissolves in cold water, and to prevent it from dissolving in the plant sap, it is converted into starch, which is only slightly soluble in water.

What happens if?

- 1- The light depended reaction will not occur.
- 2-Water will split into oxygen and hydrogen.
- 3-The covered part of the leaf will not make photosynthesis and the starch will not be formed.



WORKSHEET (5)

a- Give reasons for:

- 1- Because mitochondria considered as the power station that produce energy
- 2- y in the form of ATP molecules.
- 3- To increase energy production.

b- Compare between each of the following:

1-

Catabolism	Anabolism
Processes in which the energy of ATP molecules is released by breaking down a large molecule that has been built before into simpler molecules, such as breaking down of glucose molecules during cellular respiration and breaking down of protein molecules and glycogen molecules during digestion.	Processes in which the energy of ATP molecules is consumed in building a large, complex molecule from many simple molecules, such as the formation of glycogen from glucose and the formation of proteins from amino acids in the cytoplasm and ATP molecules from ADP molecules.

2- **Cellular respiration**

photosynthesis process

The process of breaking down the large molecules of nutrients such as glucose inside the living cells in the presence of oxygen, where the atoms are rearranged to form smaller molecules of water and carbon dioxide gas, releasing a quantity of energy in the form of **ATP** molecules. This process is known as **cellular respiration**, most of which takes place inside the **mitochondria**

It is a process by which plants use sunlight, carbon dioxide & water to produce glucose sugar and oxygen gas.

c- What will happen if...?

- 1- The breaking down the large molecules of nutrients such as glucose inside the living cells will decrease and may stop.
- 2- A large quantity of energy in the form of ATP molecules & Water will not produce.

d- What is meant by:

- 1- Specialized organelles that resemble beans and are found in most cells.
They work as power stations, producing energy from nutrients.
- 2- It is a biological process in which carbon dioxide gas and oxygen gas are exchanged with the surrounding environment to complete the photosynthesis process during the daytime and the respiration process during the day and the night.



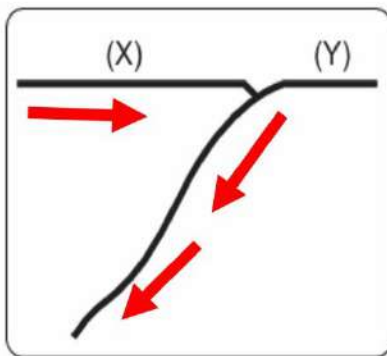
WORKSHEET (6)

Meteorites: are rock masses that penetrate Earth's atmosphere and fall to the ground.

Its role: Some of them cause huge circular craters, such as the Arizona crater in the United States and the Mount Kamel crater in the Western Desert in the New Valley Governorate in Egypt.

The following figure shows a convergent boundary:

(1)



(2) Classify the plates (X) and (Y) into continental plates and oceanic plates, with explanation.

Plate X: **Continental**

Plate Y: **Oceanic**

The oceanic plate which is greater in density sub-ducts under the continental plate, which has less density.

GOOD LUCK!

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